



FRIDAY, JULY 21, 1876.

Paper Car Wheel.

The engraving represents a section of the paper car wheel described in our article of June 16 on the International Exhibition. The wheel consists of a central cast-iron hub, a disc of compressed paper, *C C*, inclosed between two wrought-iron plates, *A* and *B*, and a steel tire, *D*. The engraving is so plain that no further description is needed. The wheel is 42 in. in diameter and is the same as those used under the Pullman car in the Exhibition. These wheels are made by the American Paper Car Wheel Company, of Hudson, N. Y., and are now extensively used by the Pullman Car Company, both in this country and in England. The process of their manufacture was fully described in the *Railroad Gazette* of June 16, to which readers are referred.

Railway Resistances.

[A paper read before the American Institute of Mining Engineers at the Washington meeting, February, 1876, by P. H. Dudley, C. E.]

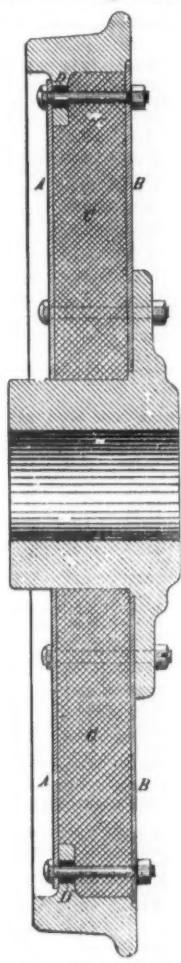
In giving a brief account of the experiments in progress to inquire into some of the facts in regard to "railway resistances," recently commenced upon the Lake Shore & Michigan Southern Railway, with the dynamograph, which is essentially an instrument recording upon paper the force required to draw a train, at all speeds, marking the time in short intervals, so that the force absorbed due to any change of speed can be readily computed, I am well aware that but few of the members are directly engaged in railway construction; yet as all are interested in efforts to reduce the cost of transportation between the mines, manufacturing and agricultural industries of the country, I trust that the account will be of interest and importance to us all. We commenced using the dynamograph last November, and, while it may seem a simple thing, it has taken a long time to properly understand and interpret the record as made upon the paper.

Although only connected to the locomotive by the ordinary link and pin, every movement of the lever of the throttle valve and of the reversing lever are at once indicated and recorded, and upon heavy freight trains opening of cylinder cocks is generally shown. Each locomotive and engineer gives the record a distinct individuality, the former depending upon its condition and the latter his ability to run even and steady. To eliminate the latter irregularities, we now have the same engine and engineer in making experiments with single cars and short trains. It took time to find out all this, and as soon as the track became soft from the excessive wet weather we had in the vicinity of Cleveland during the winter, it gave us new indications to study and interpret. Now, by passing over a track, we can tell whether it is in good condition, or whether the engines are working properly or not, as to the admission and release of steam in the cylinders. The latter indication is much more difficult to determine than any other, as it makes a record similar to that of a rough track.

The Lake Shore & Michigan Southern Railway has a double track of steel rails, well ballasted and in fine condition. From Cleveland to Erie it is nearly all tangent, the grades not exceeding 16 ft. per mile. The radius of curvature is very large, ranging from 2,000 to 20,000 ft. with but one or two short curves of the shorter radius. With a stock train of 709 tons (of 2,000 lbs. each) at a speed of from 16 to 18 miles per hour, the resistance upon a straight line was from 6.5 lbs. to 7.1 lbs. per ton. Box cars of same weight of train did not differ much as to resistance per ton. The cars were mostly of the Lake Shore & Michigan Southern Railway construction. Chilled iron wheels, 38 inches diameter, broad tread, covering about $1\frac{1}{2}$ of an inch in 4 inches; weight 550 lbs. Journals ranging from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches in diameter and $5\frac{1}{2}$ inches long. For oiling they use petroleum nearly in a crude state. Two styles of brasses are used, both when new (and designed to do so when worn) bear on the journal their entire length; but one brass only bears in the center about two inches against the upper part of the box, and as the brass wears thinner by the pressure, springs off the journal at the ends, and a short bearing is left in the center, and without great care is liable to heat and get to cutting. It is not uncommon to find a journal worn a quarter of an inch smaller in the center than at the shoulder and collar. The other brass has a good bearing upon the top of the box, the entire length of the journal, and seems to wear better, do more service, and run easier when old than the kind first mentioned. In all of the experiments with single cars we found, when light, that those which had a six-inch brassing, with same size of journal ($3\frac{1}{2}$ inches), ran easier than those with shorter journals. The system of lubrication seems to be somewhat deficient. The waste catches the brass which is ground off, mixing with the oil, and it is constantly being used over and over again, keeping the journal in simply an unmet state and not in good condition of lubrication. We took cars, which were said by the carmen at Ford's to be in good condition, the oil and brass were all mixed together, like a thin paste, and had some fresh oil turned into the boxes, decreasing the power required to draw the cars from 10 to 20 per cent. One great object we had in view when we constructed the dynamograph was to test the friction of various kinds of coal equipment in use in the Eastern coal districts, as well as that used West, where the car is 28 feet long over all, with 18-inch sides, and weighs from 80 to 95 per cent. of the coal carried. Very few of them have dumper bottoms, and those which have only permit a small quantity to run out, without shoveling. In the Eastern States, many varieties are in use having dumper bottoms, and only weigh from 50 to 55 per cent. of the coal carried. A car in which the dead-weight is reduced 30 to 40 per cent., other conditions being equal, would materially reduce the cost of transportation on Western coal, and be of advantage to the producer as well as to the consumer. Our Western coal cars, for some unexplained reason, do not seem to draw any easier than box or stock cars, at speeds of from 12 to 15 miles per hour. Our coal roads are very crooked, and in curving the longer cars offer more resistance than the shorter ones. The construction of the trucks, and the manner of bearing upon the transoms, have much to do with the ease in curving. After we had made some experiments upon the movement of trains upon the Lake Shore & Michigan Southern Railway, we came to the conclusion that those long and heavy trains of 700 to 750 tons could be run with less fuel at the rate of 18 to 20 miles per hour than they could at 12 miles, their regular time-table rate. On Dec. 3, 1875, a stock train of 709 tons was run through, at the rate of 20 miles per hour, and on Dec. 13, 1875, a train of same weight, with same kind of journals, was run at the rate of 13 miles per hour. It was, however, 17° Cent. colder. The difference in coal used by the same engine was 1,485 lbs. The colder day required some of the additional coal, but not the difference made. Subsequent experiments have all corroborated the first conclusions.

After the inertia of the train is overcome, which, in the long trains, seems to be about a speed of twelve miles per hour, the cut-off is moved back, the steam used more expansively, and the light gradients, at the increased velocity, are overcome much more easily than at the slower rates, which, to use an engineer's expression "becomes a drag to pull the train," when running too slow. To what extent this will be found true upon other roads, using their steam in a different manner, hauling shorter and lighter trains, must be determined by future experiments. The increased damage to machinery, running at the increased speed, must also be taken into consideration. It is a subject worthy of much careful investigation, as it would add largely to the capacity of the road, a much more rapid transit of freight, more service with the same number of cars, and less time on the road for the men on trains.

We do not find it true that the power to move trains increases with the square of the velocity. On some simple cars it only increased to that due to the square of the velocity of the wind acting on the frontage of the cars, the friction of the car remaining almost a constant quantity. I do not think it will hold good for all the various kinds of car construction, as some are decidedly faulty in all respects as to a minimum amount of friction. The amount of power used to draw the stock train from Cleveland to Erie, 95 $\frac{1}{2}$ miles, was 2,498,396,320 foot-pounds, besides that required to move the locomotive itself. 8,425 lbs. of coal are used, each pound giving 296,545 foot-pounds of power, 3 per cent. of the chemical value of the coal. The extra power required to overcome the inertia of the train on a level was in one instance 35,696,950 foot-pounds, which may be considered a fair average of the power lost each time this train was stopped. Dividing this by 296,545, the amount of power developed by 1 lb. of coal, and it will give the number of pounds of coal used to start this train, which in this case was 125. The same amount of power on a level would send the train two miles, and it requires from two to two and one-half miles to get the train under motion.



Paper Car Wheel.

I introduce this here to show the great loss which occurs in stopping heavy freight trains. More particularly at grade railway crossings, which upon the line under construction, taking the expense of fuel, water and watchmen for 50 trains per day, amounts to 45 cents for each stop, without taking into consideration the extra wear of rolling stock, track, detention of trains, and the constant danger of accident.

The most notable increase of resistance of trains was found in passing over the Cleveland & Pittsburgh Railway having an iron rail with the joints from $\frac{1}{2}$ to $1\frac{1}{4}$ inches lower than the centre of the rail. Most of the joints were opposite.

Besides the power which would on a good steel rail be required to draw the train, the increase due to the shocks ranged from nothing to 4,000 lbs. In computing the cost of moving freight over such lines, the extra wear of machinery and track must be added to the expense of the argumented power required by the rough track. The iron rail does not have sufficient elasticity to return to a normal position at the ends, but takes a permanent set to some extent from each wheel as it passes over it. The ordinary fish-plate is entirely inadequate to make a good joint, sustaining the ends of rails as they should be to make a good track, on many of our "hallow-ballasted" roads. Passenger coaches are made to ride so easy that the principal officers of the rough lines do not get sufficient jolting and jolting to remind them of the shocking condition of many of the iron tracks. We have not worked up many of the results, as we find every detail of car construction, track and locomotive construction will have to be taken into consideration, also many of the features of management. I do not expect that we can make for every road its distinct features. We do not expect to revolutionize everything connected with railways, but facilities are afforded and attention paid to the facts developed. Many things connected with transportation may be cheapened. I am trying to find out fact, and not to support any system or plan of moving freight upon railways. I will very briefly explain some of the features of the diagrams.

DESCRIPTION OF THE DYNAMOGRAPH.

The dynamograph is an instrument designed to measure and record upon paper the resistance due to the movement of

trains; also shows by the kind of line made, the general condition of the track and motive power. It is fitted into a car which is attached next to the locomotive, and is of the following described general construction: underneath the car is a steel cylinder filled with oil, having two pistons, one four inches and the other $1\frac{1}{2}$ inches in diameter, so arranged that either one can be used at pleasure. The draw-bar of the car is extended back and draws directly on the piston, which forces the oil in the cylinder through a pipe to a small cylinder, in which is fitted a piston, acting against springs of known tension. The cross-head of the small piston moves the lever, carrying the pencil, which records upon the moving paper the amount of force exerted. The paper used is 10 $\frac{1}{2}$ inches wide and is in lengths ranging from 150 feet to 400 feet.

The paper is moved by direct motion from the car axle. It is wound upon a drum upon one side of the instrument, and passes through between two steel rollers, over a little table about one foot square, through another set of steel rollers, and thence to another drum, which winds up the paper as it passes through the rollers. Usually one-fourth of an inch of paper is made to represent one hundred feet on the track passed over. An electrical chronograph records the time every $7\frac{1}{2}$ seconds, consequently the speed for any given instant can be calculated, as it is necessary data in making the calculations.

EXPLANATIONS OF THE DIAGRAMS.

The force line and chronograph line are full size as to length, but in order to get so many diagrams on one sheet the vertical distance between the zero line, force line and chronograph line are reduced to suit the engraving.

No. 1, No. 2 and No. 3 were taken with the large piston on heavy freight trains. No. 1 was taken upon the Lake Shore and Michigan Southern Railway, and shows the force required to start a train of thirty-five loaded cars, one caboose and dynamograph car. Total weight 709 tons. About 3,000 feet in length are represented.

The zero line of force for this diagram is the broken line extending partly through diagram No. 4.

The chronograph line for this diagram is the upper one on the sheet, and the one immediately under it the record of force required to start the train from the Union Depot at Cleveland, Ohio. It was a Mogul engine, having 49,600 pounds upon the drivers, and would pull 1,000 to 1,500 pounds more than that shown upon the diagram before slipping her drivers, upon a good rail.

The slightly irregular line at first is due to a slight movement of the throttle valve by the engineer, while the downward movement of the force line in the last 1,000 feet is due to the speed of the train and setting back the reversing lever.

The figures upon the force line show the pounds of force exerted upon the draw-bar to draw the train, per instant.

No. 2 represents 4,000 feet in length, run by an ore train upon the iron rail of the Cleveland & Pittsburgh Railway. Weight of train, 313 tons. The zero line is the same as that of No. 3, which is also the chronograph line of No. 4. The speed of the train is shown by the upper chronograph line.

The vibrations of the force line were caused by a rough iron track, the joints being very much depressed. These vibrations are very much below the average; as many of them were so great the various ones could not be easily distinguished, much less engraved; to check them were obliged to use a spring draw-bar.

No. 3 is the same train upon the Lake Shore & Michigan Southern Railway as No. 1, when running along at its usual speed, which is shown by the chronograph line drawn through No. 1 and No. 2. It will be noticed the force line is quite uniform, which we found to be so when the track (steel rail) was in good condition, well ballasted and the engine in order; but when otherwise the force line assumes the character of that shown in No. 2.

Diagrams No. 4 and No. 5 are some of a series of experiments with two or three cars, and represent starting them and a run of about $1\frac{1}{4}$ miles. The cars were two loaded Empire cars, and with a dynamograph car weighed 52,055 tons of 2,000 pounds each. The engine used to draw them is a small one, having a single pair of drivers, and the tender is rigidly attached to the engine, and when running constantly oscillating from side to side, which gives the force line a vibratory motion. No. 4 was run at 20.9 miles per hour, and No. 5 (same train) was run at 8.7 miles per hour.

The chronograph line of No. 4 shows as it appears when a train is running fast, though somewhat exaggerated in this.

After the diagrams are taken they are all calculated, and the number of foot-pounds obtained required to move the train for the run or any given distance.

Report of the Committee on Railway Resistances.

To the American Institute of Mining Engineers:

The committee appointed at the February meeting upon Railway Resistances would respectfully report:

That one person has been constantly employed in calculating the results of the data which were taken prior to March 1, 1876; also to complete the data taken upon the Lake Shore & Michigan Southern Railway, a diagram was taken on a through freight train from Cleveland to Chicago, and one from Chicago to Cleveland. So that now we have diagrams from Buffalo to Chicago and return, which, when fully worked up, will give results of the utmost importance in determining the cost of transportation of freight. These data will be of much importance in determining the proper methods of equating grades and curves, which is so essential in the location of new lines.

The calculations show that instead of our attempting to formulate results from data obtained on one road, it will be best for the interests of transportation to enlarge the scope of inquiries, and to extend the experiments so as to include all of the more probable causes which affect the cost of transportation. Were the details of railway equipment constructed alike, much work, which is now necessary, would be saved.

It is not uncommon to find upon the same road 10 to 30 different patterns of the same thing in construction to subserve the same purpose, which more or less modifies the friction of the cars. Take the majority of our trunk lines, and with this diversity of construction, together with the varying conditions of track and manner of operating, and it will be at once seen that the labor and time to do the work and arrive at correct conclusions will occupy from two to three years. The results already attained in the short time in which they have been carried on, wholly by private interest, simply show what may be expected when given the aid necessary to render them of the highest value to the great industries of the country. That the information may be general and of the greatest importance to our railway interest, the committee deem it advisable to secure, so far as may be, the co-operation of all the leading railways of the country, and have them assist in carrying on the work now inaugurated, as in that way it would reduce the cost to each road to a minimum and still give them all the full benefits of the work done upon other roads as well as their own. Some of the leading Eastern and Western railways have been solicited to aid, and we think we can without doubt secure their co-operation as soon as they fully understand its importance and value to their own interest. "Large bodies move slowly," especially towards scientific investigation. There will appear for publication with this paper several sheets of data and calculations embracing nearly all of the experiments made with single cars, constructed at the Collinwood yards of the Lake Shore & Michigan Southern Railway, eight miles east of Cleveland, O.

The track is all tangent and ballasted with gravel. It was

EXPERIMENTS MADE WITH THE DYSGRAPH, AT COLLINGWOOD, OHIO, BY P. H. DUDLEY, UPON LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

WITH SINGLE EMPTY CARS.

Car, kind.	No.	To what railway belongs.	Date of experiment.	Size of journals.	Weight of load in tons, including dysgraph car.	Velocity in feet per second.			Average speed in miles per hour.	Resistance in lbs. per ton, Observation corrected for.		State of weather.	Temperature.	Height of barometer.	Wind.		REMARKS.
						Initial.	Final.	Difference.		Level track.	Uniform velocity.				Direction.	Velocity in miles per hour.	
Box D.	9,109	L. S. & M. S.	Jan. 31.	3 1/4 x 6	18,225	16.5	19.6	3.1	11.7	5.44	4.74	Fair.	22°	30.17	S. S. E.	12	Journals badly worn, from 1-16 to 3-16 of an inch, oiled with petroleum.
"	"	"	"	"	"	37.6	40.1	2.5	21.1	10.84	9.81	"	"	"	"	"	"
"	"	"	"	"	"	28.7	29.3	0.6	19.6	6.97	7.13	"	"	"	"	"	"
Box	7,866	N. T. C.	"	3 1/4 x 6 1/2	20,205	18.31	14.00	4.31	14.3	9.38	0.51	"	"	"	"	"	From some unexplained cause the resistance appears to be very low on this car, though everything seemed to be in perfect order about the instrument. Brasses worn somewhat, the journals varying in size from wear.
"	"	"	"	"	"	27.65	28.08	0.43	19.2	3.79	3.64	"	"	"	"	"	"
"	"	"	"	"	"	32.96	42.57	9.61	26.5	12.57	7.98	"	"	"	"	"	"
Box D.	9,312	L. S. & M. S.	Feb. 1.	3 1/4 x 5 1/2	2,029	18.95	18.17	0.78	12.5	3.93	4.11	"	38°	29.71	S. S. E.	11	"
"	"	"	"	"	"	27.34	31.51	4.17	20.4	9.31	7.64	"	"	"	"	"	"
"	"	"	"	"	"	35.29	47.7	12.29	29.1	17.39	11.40	"	"	"	"	"	"
Stock D.	5,298	"	Feb. 2.	3 1/4 x 5 1/2	2,02	15.0	14.33	0.67	9.4	4.46	4.58	"	10°	30.16	West.	29	Brasses worn somewhat, the journals varying in size from wear.
"	"	"	"	"	"	26.59	32.64	6.05	20.8	11.45	9.95	"	"	"	"	"	"
"	"	"	"	"	"	36.72	46.50	9.82	28.4	22.94	17.51	"	"	"	"	"	"
"	"	"	"	"	"	20.0	17.00	3.00	11.9	3.07	3.77	"	"	"	"	"	"
"	"	"	"	"	"	28.0	30.33	2.33	20.4	10.77	9.90	"	"	"	"	"	"
"	"	"	"	"	"	38.42	47.87	9.45	30.0	24.2	18.96	"	"	"	"	"	Newly oiled.
Box D.	13,226	"	Feb. 3.	"	2,000	14.00	14.42	0.42	9.2	7	7.53	Cloudy.	10°	30.23	S. E.	13	"
"	"	"	"	"	"	27.73	34.00	6.27	22.3	13.6	11.13	"	"	"	"	"	"
"	"	"	"	"	"	36.31	47.06	10.75	29.5	22.69	17.02	"	"	"	"	"	"
Box	25,634	B. & O.	Feb. 10.	2 13-16 x 5 1/2	19,895	17.75	15.66	2.09	10.4	4.79	5.23	"	"	"	"	"	"
"	581	M. D. T. Co.	"	3 1-16 x 5 1/2	2,016	28.27	35.56	7.29	20.9	7.82	6.16	"	"	"	"	"	"
"	"	"	"	"	"	16.75	14.28	2.47	9.7	5.78	6.27	"	"	"	"	"	"
"	"	"	"	"	"	28.27	32.00	3.73	21.3	11.99	10.55	"	"	"	"	"	"
"	"	"	"	"	"	34.75	46.77	12.02	28.2	20.9	14.64	"	"	"	"	"	"

WITH TWO EMPTY CARS.

Box	9,109	L. S. & M. S.	Jan. 31.	"	28,715	17.75	20.94	3.19	11.6	3.58	2.79	Fair.	22°	30.17	S. S. E.	12	"
"	9,312	"	"	"	"	29.57	32.50	2.93	21.1	7.88	6.71	"	"	"	"	"	"
"	"	"	"	"	"	24.39	25.84	1.45	17.0	4.41	3.95	"	"	"	"	"	"
"	"	"	"	"	"	35.81	46.92	11.11	28.9	17.33	11.44	"	"	"	"	"	"
Box D.	9,312	L. S. & M. S.	Feb. 1.	"	28,655	10.00	9.40	0.6	6.0	3.68	3.82	"	38°	29.75	S. S. E.	11	"
"	9,706	"	"	"	"	21.08	19.11	1.97	13.1	4.49	4.98	"	"	"	"	"	"
"	"	"	"	"	"	26.50	39.23	6.73	20.6	11.66	9.08	"	"	"	"	"	"
"	"	"	"	"	"	36.7	47.3	10.5	29.3	19.43	12.78	"	"	"	"	"	"
Box	3,278	N. T. C.	"	"	29.9	16.10	13.27	2.83	8.8	3.60	4.39	"	"	"	"	"	"
"	7,866	"	"	"	"	26.20	30.60	4.40	19.6	12.05	10.46	"	"	"	"	"	"
"	"	"	"	"	"	22.00	30.30	1.70	14.1	3.40	3.85	"	"	"	"	"	"
"	"	"	"	"	"	36.21	45.66	9.45	28.2	17.26	12.32	"	"	"	"	"	"
Box D.	13,226	L. S. & M. S.	"	"	30.3	16.62	15.66	0.96	10.9	5.9	6.1	"	"	"	"	"	"
"	14,031	"	"	"	"	25.47	29.33	3.86	19.3	10.51	9.16	"	"	"	"	"	"
"	"	"	"	"	"	35.87	46.07	12.20	30.00	23.37	16.83	"	"	"	"	"	"
"	5,298	"	"	"	30,815	16.88	17.00	0.12	10.3	5.53	5.50	"	"	"	"	"	"
"	6,689	"	"	"	"	22.66	26.40	3.74	16.66	10.32	9.15	"	"	"	"	"	"
"	"	"	"	"	"	35.00	45.50	10.50	28.2	23.48	18.08	"	10°	30.15	West.	29	"

WITH THREE AND FOUR EMPTY CARS.

Box	9,109	L. S. & M. S.	Jan. 31.	"	37.08	18.88	20.37	1.49	12.6	3.82	3.44	Fair.	22°	30.17	S. S. E.	12	"
"	9,312	"	"	"	"	27.79	30.21	2.42	20.3	7.50	6.60	"	"	"	"	"	"
"	9,706	"	"	"	"	35.09	44.36	9.27	27.7	17.17	12.43	"	"	"	"	"	"
"	"	"	Feb. 1.	"	"	17.0	15.7	1.3	10.8	4.15	4.42	Wet Rail.	38°	29.75	S. S. E.	11	"
"	"	"	"	"	"	33.78	38.18	4.40	25.3	12.65	10.62	"	"	"	"	"	"
"	"	"	"	"	"	36.45	46.50	10.05	30.0	20.30	14.94	"	"	"	"	"	"
Box	3,278	N. T. C.	"	"	39,675	24.55	20.32	4.23	15.0	3.37	4.58	"	"	"	"	"	Axles much worn, varying from 2 1/4 x 6 1/2 to 3 1-16 x 5 1/2 inches, brass 6 inches long.
"	7,866	"	"	"	"	25.94	30.78	4.84	19.5	9.2	7.45	"	"	"	"	"	"
"	9,312	"	"	"	"	32.67	47.33	14.66	27.9	21.97	14.48	"	"	"	"	"	"
"	9,706	"	"	"	"	34.41	42.07	7.66	26.68	16.38	12.64	"	"	"	"	"	"
Box	5,298	L. S. & M. S.	Feb. 2.	"	3,951	18.8	18.5	.03	13.3	6.80	6.87	Fair.	10°	30.15	West.	29	Axles and wheels much worn, axles varying from 2 1/4 x 5 1/2 to 3 1-16 x 5 1/2 inches.
"	6,689	"	"	"	"	28.0	31.3	3.3	20.9	12.65	11.40	"	"	"	"	"	"
"	7,813	"	"	"	"	36.10	46.50	10.4	29.5	23.43	17.98	"	"	"	"	"	"
Box	5,298	"	Feb. 2.	"	49,585	20.1	15.3	4.8	11.2	4.87	5.95	"	"	"	"	"	Axles much worn. See above.
"	6,689	"	"	"	"	30.3	34.7	4.4	22.6	19.85	18.03	"	"	"	"	"	"
Box	9,198	N. T. C.	"	"	"	35.6	48.2	12.6	29.3	24.57	17.82	"	"	"	"	"	"

ONE AND TWO LOADED CARS.

Box	1,475	B. & A.	Feb. 25.	"	27.51	16.61	15.24	1.37	9.5	3.79	4.06	Clear.	17°	30.11	S. S. W.	12	"
"	"	"	"	"	"	20.37	16.17	4.20	13.2	1.98	3.06	"	"	"	"	"	"
"	"	"	"	"	"	24.91	26.17	1.26	18.0	4.2	3.80	"	"	"	"	"	"
"	"	"	"	"	"	26.00	27.12	1.12	18.5	3.62	3.25	"	"	"	"	"	"
"	"	"	"	"	"	17.44	17.19	0.25	11.6	2.76	2.86	"	"	"	"	"	"
"	"	"	"	"	"	24.99	30.60	5.61	18.6	5.98	4.01	"	"	"	"	"	"
Coal D.	13,226	L. S. & M. S.	Feb. 3.	"	45.35	18.41	16.1	2.3	10.8	4.75	5.24	Cloudy.	10°	30.33	S. E.	13	Newly oiled.
"	14,031	"	"	"	"	27.6	34.4	6.8	21.8	14.62	12.00	"	"	"	"	"	Newly oiled.
"	"	"	"	"	"	35.53	49.30	13.77	28.6	22.11	14.83	"	"	"	"	"	"
Box	3,277	Empire	Feb. 4.	"	52.55	15.5	17.0	1.5	8.7	5.94	5.64	Fair.	17°	30.28	West.	20	"
"	3,744	"	"	"	"	27.12	32.82	5.70	29.9	9.79	7.69	"	"	"	"	"	"
Box	5,835	S. & I. R. E.	"	"	"	33.78	46.00	12.22	28.2	19.12	13.10	"	"	"	"	"	"
"	8,293	L. S. & M. S.	Feb. 25.	2 13-16 x 6 1/2	48.06	23.89	27.46	3.57	17.8	11.77	10.67	Clear.	5°	30.39	N. N. W.	20	"

about 1 1/4 miles long between the switches and laid with steel rail.

All calculations were made from the diagrams as shown between the 8th and 9th mile post. The line has two gradients requiring 3.6 lbs. of force to overcome these, in addition to that given in the calculations.

In each experiment we endeavored to run each car or cars first at a speed of 10 miles per hour, then at 20, and then at 30, but from the short distance to run before acquiring speed to pass the 8th mile post it was found impossible to run the cars exactly as desired. We did not allow the engineer to change his throttle valve or reversing gear after passing the 8th mile post, so that there would be no changes of force due to increase or decrease of steam pressure, as such changes are at once recorded upon the paper, and would be liable to be ascribed to some other cause.

The locomotives used for these experiments are quite small ones, having a single pair of drivers, the tender and boiler rigidly connected, and they do not run steadily but are in constant oscillation, making the diagram somewhat uneven. As the runs could not be made with uniform velocity, we had to reduce them to a basis of uniform speed. It will be noticed in the tables that there is a column of initial velocity, which is that of passing the 8th mile post, and one of final velocity, which is that of passing the 9th mile post. The chronograph, which registers the time every 7 1/2 seconds, shows whether the velocity is being accelerated or retarded, and at what points. The cars experimented upon were such as we found in daily use at the yards. In the final resistance given in the sheets that due to the air is included. As yet we have not been able to use anything which gives uniform results as to the effect of the wind, though we have used the most sensitive anemometers and vanes.

It is thought the difference is largely due to the eddies which are formed by whatever we attempt to use in connection with the motion of the car. We cannot explain many

anomalies which occur in the results of single cars. Some of them are doubtless due to difference in the engineers who ran the engines, and to sudden changes of wind. The diagrams in which they occur do not indicate that anything was wrong with the working of the instrument, yet it is possible that such was the case. The service upon the instrument with single cars is much more severe than when drawing a heavy train, as the piston is so much smaller for that work. The strain upon the pipes and joints often exceeding, in steady work, 2,000 lbs. per square inch, and, adding that due to shocks, makes it very difficult to keep the instrument in proper order, without constant care.

We find, in all our experiments, when the weight of the cars is partially carried upon the ends of the truck frames, that after passing curves or switches they oftentimes run long distances before they will straighten out and properly track, and not bind upon the flanges of the wheels, thereby causing increased friction, which often shows in the results of our experiments. It is seldom that we find journals upon the same cars of the same size; the wear is not uniform, ranging from 1-16 to 5-16 of an inch on the different journals of the same car. Flanges of wheels are often badly worn upon opposite wheels and the axles are not parallel. There does not seem to be any uniformity as to the width and length given to bearings; some will have 2 inches and 2 1/2 in width, the length varying from 5 to 8 inches. As a rule, we have found that a bearing of six inches in length runs easier than one of five, and is not so liable to heat.

In loaded cars, especially after standing some time, the lubricant seems to be forced from between the journal and brass, so that the car needs to be run a short distance, or newly oiled, before it will run at the usual friction. The friction seems to be higher per ton in loaded cars than in empty ones. We have not as yet attempted to formulate any of the information we have obtained, deeming it of importance to gain more before reaching definite conclusions. It will doubtless be necessary

to have constants to apply to a general formula for the variously constructed cars, or to have distinct formulae for them. In all of the experiments detailed upon the sheets or tables, petroleum was used as the lubricant, excepting that of the Baltimore & Ohio car, which was a kind of grease used by that company. This car had 30-inch wheels, all the others 33-inch wheels. In making further experiments with single cars, every detail of construction which can affect the resistance of the car will be taken into consideration, for the purpose of finding out what is best, and to initiate a system of uniform construction for cars intended for the same purpose. The expense to the great trunk lines in keeping so much stock on hand to repair cars of different construction is a very large tax upon transportation.

The experiments upon heavy trains furnish the most accurate means of determining the cost of moving freight over the railways. In all instances where it can be done, we take the weight of coal consumed, and by that means have found how much power each pound of coal developed in moving the train. From these data, it will be easy to calculate the cost in fuel of moving freight upon any portion of the line having different gradients, and what is equally of importance, the cost of making stops. This was mentioned in a previous paper, yet, possibly, some will hear this now who did not then, therefore we will repeat it briefly.

Engine 435 of the Lake Shore & Michigan Southern Railway developed to move the train, for each pound of coal consumed 296,545 foot-pounds of power, or less than 3 per cent. of the theoretical power of the coal. To start the train, weight 709 tons, and get it under full motion, it took from 20,000,000 to 40,000,000 foot-pounds, depending upon the place and circumstances. In one place it was 30,896,950 foot-pounds; dividing this by 296,545, the power developed by 1 lb. of coal, and it gives 120.4 as number of pounds of coal consumed after the stopping of the train to again get it into motion. Take into further consideration the loss of time and delays to business, and it

will be seen that stops are expensive; therefore the time-table should be so arranged, as far as practicable, so that through trains should only stop for water and at terminal division stations and railway crossings. In through lines more attention should be given to the avoidance of grade crossings, not only as a safety measure, but one of economy. In a short time we fully believe that it will be found cheaper in great trunk lines to arrange the freight engines so that they will take water while in motion, or by condensing a portion of the exhaust steam, so as to require but a small part of the water now used. On the Cleveland & Pittsburgh Railway (in an ore train run) from Cleveland to Wellsville, 1 lb. of coal developed 398,763 foot-pounds to move the train, utilizing in moving the train about 4% per cent. of the theoretical power of the coal, showing a great gain over that developed on the Lake Shore & Michigan Southern Railway. We consider the values of the different engines given by these experiments of the greatest value, in determining those which are the most economical for freight purposes. It affords a comparison as to the value of the number and different-sized drivers used on the engines; by taking the amount of coal used, and knowing its general characteristics, we are able to judge of the engine in an economical point of view. To show how erroneous it is to compare the work performed upon one road with that of another by the tonnage moved in miles by one pound of coal, we will state one example of comparison of the Cleveland & Pittsburgh Railway and the Lake Shore & Michigan Southern Railway. The run upon the Cleveland & Pittsburgh Railway was made with an ore train, from Cleveland to Wellsville, upon which are many long 40-foot grades to reach the table lands of the country through which it passes. On the table lands there are many short 40-foot grades, also sharp curves. The track was iron, joints very much depressed. On the Lake Shore & Michigan Southern Railway the run was a stock train, steel track, and in good condition, the line mostly tangent, the grades not exceeding 17 feet per mile. The average friction per ton of the train on the Cleveland & Pittsburgh Railway was 10.72 lbs., and on the Lake Shore & Michigan Southern Railway 6.85 lbs., the former some 57 per cent. greater than the latter. When we compared the tonnage moved per mile per pound of coal, they were almost identical, leading one to conclude perhaps that the motive power of one road was operated as economically as the other, whereas in fact, as above stated, the work done upon the Cleveland & Pittsburgh Railway per pound of coal was 50 per cent. greater than upon the Lake Shore & Michigan Southern Railway. The fine effect of steel track in this case is offset by the better adaptation of the motive power upon the other, so that each road would be improved by simply adapting the better principles of the other. It does not afford any accurate test of the economical movement of freight of two roads by a comparison of the tonnage moved in miles per pound of coal, any more than it does of a road to compare the cost of operating to the total receipts. In running trains there are many things which the careful and considerate engineer must do to pull his train over the road to the best advantage for his company's interest, which if rigidly interpreted would be a disobedience of orders. The reason for this, largely owing to the manner of making up the time tables, is in not allowing sufficient time in difficult places, and too much where it is comparatively easy. It seems to us more attention should be paid to the development within certain kinds of a more uniform development of power. This idea is new, but it is very forcibly brought out by a study of the diagrams. In ascending a grade you very soon come to a limit in the power which the engine can develop on a given strain. In many instances we have found that upon a grade the engine could not draw the load it had without backing up and acquiring a little momentum to assist it in passing the difficult place. The judicious engineer, instead of running so slowly over such places, takes advantage, and stores up a little momentum in the train to help in a difficult place. We do not approve of any reckless running, but engineers should be allowed to take advantage of those little things which oftentimes determine whether he can get over a grade or not. Having ridden several thousands of miles upon heavy freight trains, we must say that we do not believe it possible to make a uniform time table on our undulating roads, productive of the greatest economy.

In a general statement, we give the average friction per ton of 25 loaded and 2 empty cars from Toledo to Cleveland, total weight of 590 tons, at 20 miles per hour, at 1.45 lbs. From Cleveland to Erie, of 37 loaded cars, weight 109 tons, speed 20 miles per hour, 6.85 lbs., and from Erie to Buffalo, of 25 loaded and 2 empty cars, weight 512.4 tons, the friction was 7.94 lbs. per ton. These were upon the Lake Shore & Michigan Southern Railway, and include all the resistance due to gravity and air. On the Cleveland & Pittsburgh Railway from Cleveland to Wellsville the average friction per ton was for an oil train of 313 tons 10.72 lbs. per ton.

Although stated in the previous paper, we will repeat that with the same engine upon the Lake Shore & Michigan Southern Railway, to run a train at 10 to 12 miles per hour from Cleveland to Erie, it required 1,680 lbs. more of coal than it did with the same number of cars at 18 miles per hour. Weight of train about 100 tons. Upon further investigation of this question, we have found that the drivers are generally worn more unevenly upon slow running locomotives than fast ones.

We also find the statement that it requires less fuel to run trains at 15 miles per hour than at 12 is corroborated by many leading railway men. The American Society of Civil Engineers has appointed a committee upon this subject, which will co-operate with your committee.

WM. P. SHINN.
P. H. DUDLEY.

PHILADELPHIA, June 20, 1876.

THE SCRAP HEAP.

Railroad Manufactures.

At the annual meeting of the North Chicago Rolling Mill Company in Chicago, July 15, O. W. Potter was chosen President; S. Clement, Treasurer; R. C. Hannah, Secretary. The year's production of the works was 42,638 tons steel rails, 19,154 tons iron rails, and 34,389 tons pig iron. No dividend was made, the net earnings being carried to surplus account.

The Baldwin Locomotive Works recently delivered two mow engines with 18 by 24 in. cylinders to the Rome, Watertown & Ogdensburg road.

The Bessemer steel works of the Vulcan Iron Company at St. Louis were to start up this month.

Mr. Benjamin Helfrich has been appointed Receiver of the East Penn Iron Company, whose furnaces are at Lyons, Pa.

The Empire Car Works of Michael Schall, at York, Pa., are building 400 box cars for the Texas & Pacific road. Some of these cars are to be fitted with Safford's safety draw-bar.

The contract for the superstructure of the new highway bridge over the Connecticut River at Springfield, Mass., has been awarded to Thomas Leighton, of Rochester, N. Y., at \$71,500 for a riveted lattice bridge.

Besse, Graft & Woods, at Pittsburgh, have begun the manufacture of steel rails and intend to turn them out on a large scale.

The Secaucus Iron Company's furnace at Secaucus, N. J., is nearly completed, and will soon be ready to go into blast.

The Pullman Palace Car Company's works at Detroit have turned out 30 cars within the past two months, and have 20 more in progress. The last two shipped were to run on the New York & New England road.

The Pittsburgh, Fort Wayne & Chicago car shops at Allegheny, Pa., have just completed the last of a lot of 20 new passenger coaches.

Porter, Bell & Co., of Pittsburgh, have light engines under construction for roads in Texas, California and Mississippi, besides some street railroad dummies for New Orleans.

The Ohio Rolling Mill, at New Albany, Ind., has started up on rails after a short stoppage.

The works of the Joseph H. Brown Iron & Steel Company, at South Chicago, are completed and will soon be in operation. The main building is 400 by 100 feet, with several wings. The capital stock is \$500,000 and the buildings and machinery have cost \$400,000, besides the expense of ground and railroad tracks. The company has one 9 inch train of rolls, one 14 inch train, one 20 inch train, one 20 inch top and bottom mill, and one 22 inch train for making beams. There are 12 puddling furnaces and 9 Siemens heating furnaces.

The Pittsburgh Manufacturer says: "Gas is used under the boilers and in all the puddling and heating furnaces at the rolling mill of Spang, Chalfant & Co., except in two or three furnaces that have not been adapted to using gas. Before gas was introduced 3,000 bushels of coal were used daily, while now less than 900 bushels of slack coal are required. There is also a great economy in having no ashes of any consequence to be removed. The same number of heats are also made as were made with coal, and in as brief a time—in fact, the former will melt the iron in less time than the latter."

A Train Flooded Out.

The Cincinnati papers of July 9 give an account of the predicament in which a train on the Indianapolis, Cincinnati & Lafayette Railroad was caught in the tunnel at Clevel, Friday night, occasioned by a big flood of water from the storm of that afternoon, which filled the tunnel to a depth of three or four feet. A big surge of the water, as the engine plunged into the tunnel, put out the fire, and before the train reached the half-way point of the dark and underground passage it came to a dead halt, to the alarm of the passengers, who knew that the Omaha express would be along in about half an hour.

With great difficulty a man waded back through the darkness and rush of water to open air, and flagged the express. A long freight train was then brought into use to extricate the accommodation. The freight was pushed into the passenger train by the express engine, and the rear end of the rear car having been cut out, the ladies and children, and some men, were transferred to it and taken out. By this time the water had begun to subside, and the men who were not taken out on the freight train were enabled to wade out.

As soon as the water had subsided sufficiently, the accommodation train was pushed out, and then began the work of cleaning out the hundreds of car loads of mud and dirt that had accumulated on the track. This was no small undertaking, and it was not till nearly 11 o'clock that the Omaha express was ready to proceed on its way.

No person was injured to any extent. Mr. Flowers, the conductor, fell in the water twice but was rescued.

A Case of Conscience.

The St. Louis Republican of July 12, says:

"Yesterday the office of the General Ticket and Passenger Agent of one of our best known and most popular railroads was the scene of an occurrence which is exceedingly rare in these days of corruption and thieving. The assistant was gently dozing in a large arm chair with heels high cocked, wearing the monotony of fly brushing from his fevered brow by an occasional sip of that dispenser of heat, a mint julep, when his privacy was invaded and his enjoyment marred by the appearance of an apparition in a long linen duster, which, with sanctimonious speech, proceeded to make the following explanation of his business: 'Stranger,' says he, 'I am from Normal, Illinois, direct; just before leaving home, a friend of mine, who has lately experienced a change of heart and got religion, desired me to pay to the company which you represent this money, which rightfully belongs to it,' and drawing from his pocket a well-filled wallet, he handed to the surprised A. G. T. and P. A. the sum of three dollars and eighty-five cents."

"Dazed for a moment, the gentle George hesitated, fearing to trust himself with so much wealth at one time, but recovering, he hailed his rural visitor, whose form was fast growing 'small by degrees and beautifully less' in the distance, and asked him why the railroad company was entitled to the money. The rustic, casting longing glances at the fragrant mixture, then said his friend early in 1871 had occasion to travel between two stations on the — railroad, and by oversight of the conductor was not asked for his fare, which amounted to the above-named sum. The passenger, being at that time a child of sin, did not think it necessary to remind the conductor of his remissness, but calmly rode on to his destination free of charge. This, however, had not troubled him until recently, when, awakening to the full enormity of his offense, he determined to send the amount of his fare to the party to whom he considered it to belong, and for that purpose sent the money by the visitor."

"Dazed before, the A. G. T. & P. A. was now dumbfounded and did not recover himself until nothing but the empty glass, with some pieces of ice, a few blades of mint and a barley straw remained of what had once been his soul's delight and spirit's refresher. Whilst the affable gentleman with the diamond-pin from across the way was compounding another dish of the same, the portly George had resolved himself into a class in arithmetic and mentally calculated that this case of conscience had been productive of enough 'coolers' to last through the day, with a balance of hard cash sufficient to carry himself and all of them home in the evening."

Need of Power Brakes in England.

Last month a Board of Trade report was issued respecting an accident which took place about a month before on a branch of the Manchester, Sheffield & Lincolnshire Railway. In it some remarks are made which, *The Engineer* says, "will be generally appreciated by the traveling public, as they are applicable to the great majority of railway companies." "I am altogether at a loss to understand," observes Colonel Yolland, "how it is that railway companies do not at once turn their attention to furnishing their trains with a very much larger proportion of brake power than is now given, and add to it a steam brake on the engine under the sole control of the engine driver. I meet with very few railway men who do not now admit the necessity for such an increase of retarding force of a train. The collision would not have occurred if the traffic had been properly worked on the absolute block system."

RAILROAD LAW.

Action against Receivers.

The *Central Law Journal*, of St. Louis, says: "The familiar and necessary principle of jurisprudence, that when one court through its receivers has possession of certain property, no other court will interfere with that possession, and that the officers of one court are not amenable to the process of any other court, was brought to mind on Wednesday last in the Circuit Court of the United States at St. Louis, Caldwell, J., being on the bench. The receivers appointed by this court to take possession of and manage the Pacific Railroad had, in pursuance of their duty, as they thought, ordered the sinking of the track on Austin street in this city, in order to enable them to run cars to a certain elevator. The use of the street had been granted the Pacific Railroad Company, by the city, many years ago, but it appears that the sinking of the track would materially damage the abutting property. Mrs. H., a widow lady, owning property fronting on the street, brought an action in the State court to enjoin the receivers from the prosecution of this work. Both the railroad company and the

receivers were made defendants. The action was not in form prosecuted against the receivers as individuals, but named them as receivers appointed by the United States Circuit Court, and in custody of the railroad. The case was heard before Wickham, J., who awarded a temporary injunction, taking the ground that the receivers, in prosecuting the particular work, were not acting within the scope of their authority as receivers, but were mere trespassers.

"These being the facts briefly stated, Messrs. Bowman and Fortis, for the receivers, moved in the United States Circuit Court that an order be granted restraining the plaintiff from the further prosecution of the suit in the State court. Mr. Farish opposed the motion, and cited several authorities to show that where receivers act outside the manifest scope of their employment, they are amenable to any tribunal having jurisdiction over their persons, whether the one by which they were appointed receivers or not.

Caldwell, J., said that this principle was undoubtedly true. For instance, if one of these receivers had gone out upon the street and impressed the horses and wagon of a citizen, the latter could maintain replevin for them in any court having jurisdiction; but that principle does not apply here. Here the receivers are acting with reference to the property given them in charge. To say that they are using this property so as to commit a trespass upon a citizen, and that therefore they are amenable to a tribunal other than this court, is a begging of the whole question. One court having custody of property through its receivers cannot admit that another court has power to define what are their duties with reference to such property. To admit such a principle would be to permit other tribunals to instruct our receivers in regard to their duties, and to surrender control over them to the numerous courts within whose jurisdiction they are obliged to act. The learned judge said he would issue the restraining order prayed for in this case, unless the plaintiff would enter into a stipulation to dismiss the suit in the State court, and submit to an assessment of damages in the mode pointed out by law; and this was accordingly done.

Another case reported is that of Allen against the Central Railroad of Iowa, in which the Iowa Supreme Court held as follows:

1. In an action by a plaintiff against a railroad company in the hands of a receiver, to recover for being wrongfully ejected from the car, the giving of this instruction was held to be error: "The foregoing instructions are given upon the theory that plaintiff is entitled to maintain this action, but if you find that at or before the commission of the alleged injury, by a decretal order of the United States Circuit Court the defendant corporation passed into the hands of a receiver, and that in said order, among other things, it was decreed: 'That said receiver take full charge of all the property, income, profits, earnings and receipts of said Central Railroad Company of Iowa; and that the said receiver pay out of the income, receipts and earnings of the road, no debts or expenses of any kind without special order . . . except such as shall become due, belong to and come within the category and character of operating expenses of the railroad,' and you further find that no leave has been asked and given to prosecute this case, or against defendant, to and by the said United States Circuit Court, then you will find for defendant; but if no such leave has been given, or no such order and decree has been entered and made, and no such proceedings had, then you will not consider this branch of the case."

2. While a court of equity will, on a proper application, protect its own receiver, where the possession which he holds under the authority of the court is sought to be disturbed, and while a plaintiff desiring to prosecute a legal claim for damages against a receiver might, in order to relieve himself from the liability to have his proceedings arrested by an exercise of this equitable jurisdiction, very properly obtain leave to prosecute, yet his failure to do so is no bar to the jurisdiction of a court of law, and is no defence to an otherwise legal action, especially when there is no attempt to interfere with the possession of the receiver, but only to obtain a judgment at law on a claim for damages.

Railroad Crossings in Connecticut.

A law passed by the late Legislature of Connecticut provides that the selection of any town where a highway crosses a railroad at grade may represent to the Railroad Commissioners by petition in writing that the public safety requires a change in the location or approaches of such crossing, or the removal of obstructions to sight. The Railroad Commissioners shall thereupon proceed to view said crossing and to take evidence, and shall decide what change, if any, is to be made and at whose expense. Any land required for such change may be condemned in the same manner as land for the use of a railroad. The decision of the Commission shall be communicated to all parties concerned within 20 days after the final hearing, and an appeal from such decision may be taken in the same manner as provided for appeals in the matter of location of depots.

Power of a Municipality to Change Form of Aid.

In *Converse* against Fort Scott the Supreme Court of the United States decided as follows:

Where the mayor and council of a municipality were authorized to make donations of land for the right of way and other privileges to a railroad company, and to expend money for the purpose of acquiring land to be given, and to borrow money to an unlimited extent when instructed to do so by a popular vote, and likewise to issue bonds to fund any indebtedness of the city, existing or to be created, *Held*, that all conditions precedent being performed by the city, it had power to grant bonds to the amount voted in lieu of the ground and right of way.

Liability of a Carrier as Warehouseman.

In *Mavis* against the Leavenworth, Lawrence & Galveston Company the Supreme Court lately held as follows:

1. The extraordinary liability of a railroad company as carrier of goods extends not merely to the termination of the actual transit of the goods to the place of destination, but also until the consignee has a reasonable time thereafter to inspect the goods and remove them in the usual hours of business, and in the ordinary course of business.

2. This reasonable time is not a time varying with the distance, convenience or necessities of the consignee, but is such time as would enable a person living in the vicinity of the place of delivery, in the usual course of business and within the ordinary hours of business, to inspect the goods and take them away.

3. Where goods are permitted by the consignee to remain eight days in the depot of the company, at the place of delivery, that is more than a reasonable time, and if the goods are then lost or destroyed without any negligence on the part of the carrier, it is not responsible.

4. After the expiration of such reasonable time, the carrier is responsible not as carrier, but only as warehouseman and for ordinary negligence.

5. Where the carrier and shipper, by special contract, stipulated for notice without any limitations or conditions, the reasonable time for removal commences from the time of the notice, and not from the time of the arrival of the goods.

6. Where, after stipulation for notices without any agreement as to the form or conditions thereof, the carrier gives notice, with a condition written thereunder, that the liability of the carrier terminates upon the arrival of the goods, and the consignee receives such notice, without objection, and continues his shipments over the road, *Held*, that this was equivalent to a construction by the parties, and binding upon both, that the agreement for notice was simply for the accommodation of the consignee, and without extending the extraordinary liability of the carrier.



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Editorial Announcements.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

THE RESISTANCE OF RAILROAD TRAINS.

On another page we publish a paper on this subject by P. H. Dudley, C. E., which was read before the American Institute of Mining Engineers at their meeting last February. Following this paper is a report on the same subject made by a committee appointed for that purpose at the time the paper referred to was read by Mr. Dudley. The committee consisted of the latter gentleman and Mr. W. P. Shinn, Vice-President of the Allegheny Valley Railroad Company. The same subject was presented to the American Society of Civil Engineers and a resolution was adopted at a meeting held April 5 "that a committee of five be appointed to examine and report upon the resistance of railway trains; such to be without expense to the Society." This committee consisted of Messrs. Wm. P. Shinn, Alex. L. Holley, Prof. Robert H. Thurston, Charles Paine, Superintendent of the Lake Shore & Michigan Southern Railroad, and Charles H. Fisher, Chief Engineer of the New York Central & Hudson River Railroad. This committee made a preliminary report at the last meeting of the Society, which report was substantially the same as that made to the Institute of Mining Engineers. It will thus be seen that the subject has been regarded of sufficient importance to engage the attention of some of the ablest railroad managers and engineers in the country. That it is deserving of such attention, does not need to be repeated in these pages. That a series of exhaustive experiments, such as would determine a great many disputed and unsolved questions relating to car resistances, would be a good investment of money, if the cost was in some way equitably divided among a number of the most important roads, seems to us equally certain; and for this reason it is desirable that the work should be undertaken by some responsible organized committee, who could assume the direction of the experiments, or of the method in which they should be conducted, audit the accounts, and assume the responsibility for all expenditures. It is not clear, however, how the two committees which have been appointed will be able to act in the capacity indicated or can perform the duties, which must be very distinctly understood, before it can or should be expected that railroad companies will contribute money to carry out the experiments.

The present attitude of the subject, as we understand it, is as follows: Mr. Dudley, who was interested in the subject

of train resistances, had, in order to make some experiments for his own satisfaction, an instrument made which he calls a "dynagraph," which is intended to indicate the resistance to traction of one or more cars, and at the same time to draw a graphical record of that resistance, and also indicate the speed at which the car is running at the time. This instrument was applied on the Lake Shore and some other roads, which furnished him with an engine and train to make his experiments. It is the results of this work which he has given in his paper and also in the report which is published in this number of the *Railroad Gazette*, which are of very great interest to all who have given any attention to the subject. But, as is stated in the report of the committee, owing to the "diversity of construction, together with the varying conditions of track and manner of operating, and it will be at once seen that the labor and time to do the work and arrive at correct conclusions will occupy from two to three years." Obviously it could not be expected that any one would give this amount of time and labor to an investigation in which he had no other interest than a love of such research. It was for these reasons that Mr. Dudley, or his friends, brought the matter first before the Institute of Mining Engineers, and afterwards before the Society of Civil Engineers, of which, if we are correctly informed, he was not a member when his first experiments were made, but has since then been elected. His experiments excited so much interest in these societies that each of them appointed a committee to act on the matter. It is, considering the circumstances, a fair inference that one of the chief objects aimed at was to procure such assistance for Mr. Dudley as would enable him to continue his experiments. This could probably be procured through the instrumentality of such a committee, whereas it would be very much more difficult for one person, and especially the one who would expend the money, to get it unaided. Now the criticism which we think needs to be made is, that the two committees by two different societies form a very irresponsible and inefficient organization for effecting the purpose aimed at. In the report to the Mining Engineers, it is said that, "Some of the leading Eastern and Western railroads have been solicited to aid, and we think we can without doubt secure their co-operation as soon as they fully understand its importance and value to their own interests." Now this sounds too vague. If, instead of using such language, the committee of the Society of Civil Engineers, composed of prominent railroad men, should prepare a circular letter to be sent to each railroad company through the proper officer, setting forth that the committee consider it to be of great importance and that it would be of great pecuniary value to have some more correct information about the resistance of railroad cars, showing the effect of the condition of the track or the power required to draw trains; the power required to haul cars of different forms and methods of construction; the merits of various sizes of journals; of turned instead of rough wheels; the effect of having wheels of varying diameters on the same axle; of not having the axles parallel; the relative merits of side and centre-bearing trucks; of different distances apart of truck wheels; various kinds of lubricants and bearings; of wheels of large and small diameters, etc., etc.; adding that the committee have undertaken the supervision of a series of experiments to determine satisfactorily these and other points; that they will direct the expenditure of all money subscribed for that purpose and account for it to their Society and report fully all the experiments made; that the probable cost will be \$—, and that the portion of this expense which, under the system of allotment that the committee have adopted, would fall to that company would be \$—; if the gentlemen comprising this committee should in this or some similar way assume the responsibility, it would at once inspire confidence, and it is believed would insure a sufficient subscription to enable the committee to have Mr. Dudley continue his experiments, which promise to have so much value.

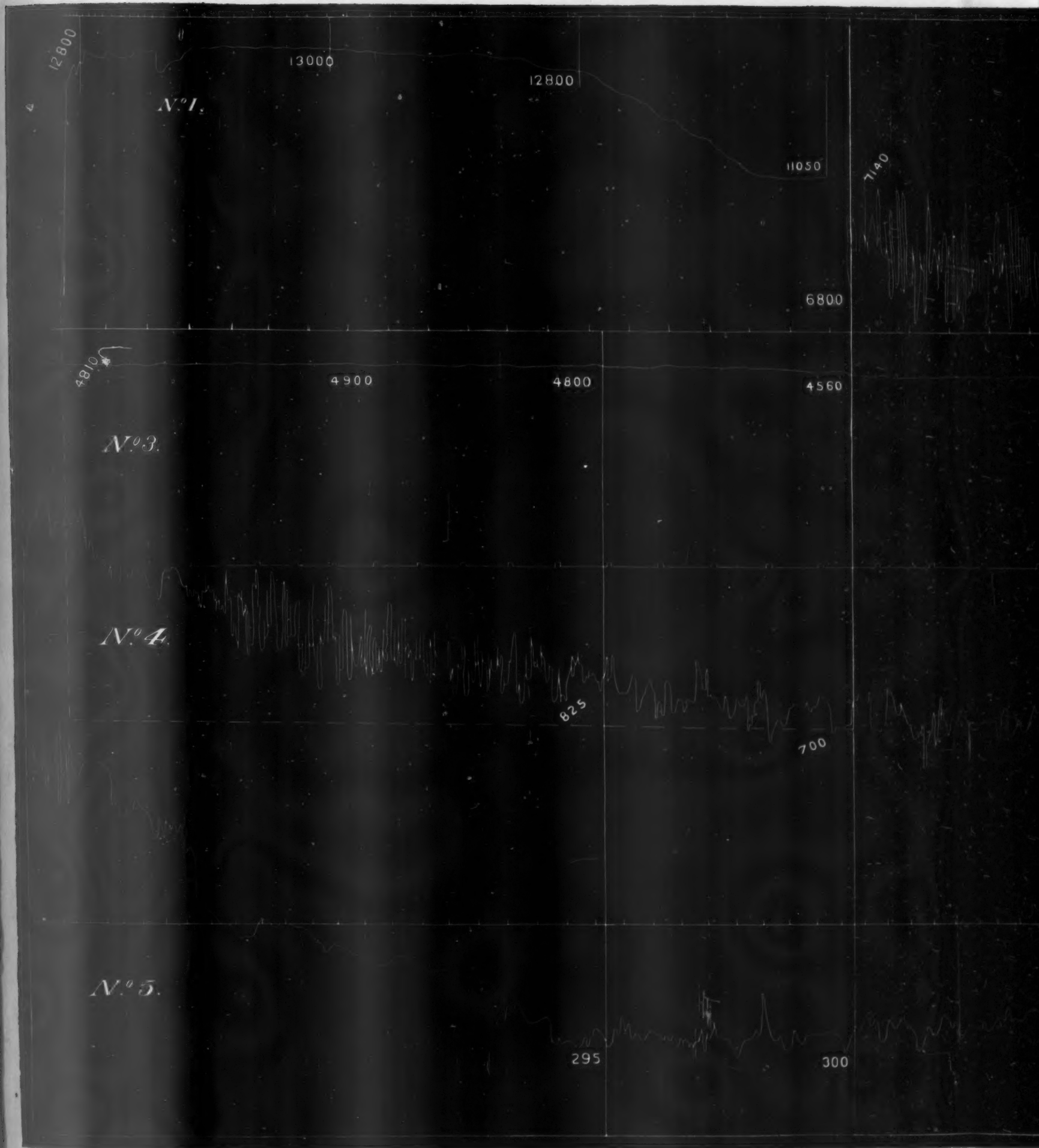
The committees are also deficient, it is thought, in not having one or more members who are experienced car-builders or master mechanics on it. If it should be thought desirable to examine and report "upon the location of railroad lines" and the Master Mechanics' Association, say, should appoint such a committee and not put any civil engineers on it, there would probably be some jeering from the members of that profession, and very justly so. Now in the report which we publish this week the committee say: "In making further experiments with single cars, every detail of construction which can affect the resistance of the car will be taken into consideration, for the purpose of finding out what is best, and to initiate a system of uniform construction for cars intended for the same purpose." Now undoubtedly a "system of uniform construction" is an end very much to be desired, but there is very great room for doubt whether those who are almost entirely without practical experience should venture to establish such a system without the advice and assistance of those who have ex-

perience in the construction and repair of cars. It has come to be the fashion of late to assume that persons who are called "civil engineers" are better qualified than any one else to direct any sort of constructive work, from an iron bridge to a sewing machine or a surgical instrument. Now civil engineers usually have the undoubted advantage of a liberal technical education, the great advantage of such training being that it aids a person in drawing sound conclusions from a large number of facts, and, as it were, of eliminating the truth from what appears to be inextricable confusion. This, it is conceived, after all that has been said about the education of engineers, is the great advantage of the mental culture and training which is acquired from books and at schools. But it must also be remembered, that in serving an apprenticeship a person is constantly the recipient of a series of object lessons which are infinitely more effective in communicating a certain kind of information than the books and the schools can expect to be. The same thing is true of the experience which a mechanic acquires in his daily work after his apprenticeship; and the observation of the foreman of a car shop during years of service in observing the wear, decay and defects of cars results in the acquisition of an amount of knowledge which civil engineers would do well to respect more highly than some of the members of that profession sometimes do. If there had been an experienced locomotive superintendent on the committee who reported to the Institute of Mining Engineers, we doubt very much whether it would have suggested in its report "that it would be cheaper on great trunk lines to condense the exhaust steam so as to require but a small part of the water now used," instead of stopping to take on a new supply. That such a plan is entirely chimerical, we think ninety-nine out of every hundred master mechanics would decide instantly.

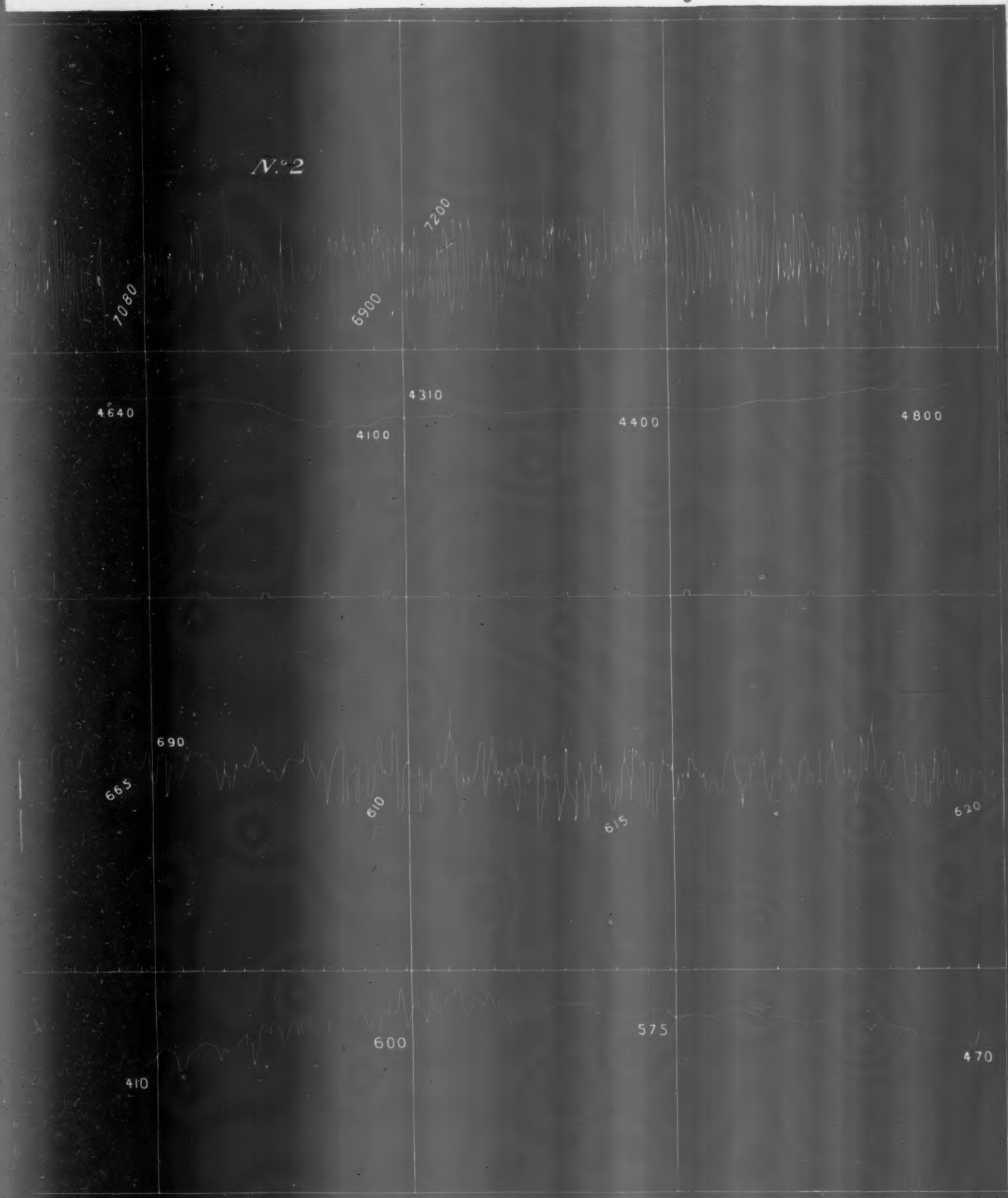
These criticisms of the work of the committee are made not with any view of undervaluing what Mr. Dudley has already done, but to indicate what seem to be points of weakness in the organization of the committees which may prevent them from doing what needs so much to be done and done well.

Mr. Dudley has already shown by his experiments that heavy trains can be run with less fuel at a speed of 20 miles per hour than at 12, a fact often suspected but never conclusively proved before. He also showed that it takes 125 lbs. of coal to start a train of 709 tons weight, a fact also which had never been clearly established. The effect of the side bearings on car trucks and the want of parallelism in the axles is indicated, but has not been fully worked out, and needs much additional investigation. The advantage of a large journal is pointed out, but not in any exact data. The most remarkable fact shown was that on the Cleveland & Pittsburgh road, owing to a bad iron track, the resistance of the cars was 10.72 lbs. per ton, whereas on the Lake Shore road on a good steel track it was 6.85 lbs. only, but the locomotives on the former road developed $\frac{4}{5}$ per cent. of the theoretical power of the coal, whereas on the latter road they developed only 3 per cent. The committee therefore say that "When we compare the tonnages moved per mile per pound of coal, they were almost identical, leading one to conclude, perhaps, that the motive power of one road was operated as economically as the other, whereas, in fact, as above stated, the work done upon the Cleveland & Pittsburgh road per pound of coal was 50 per cent. greater than upon the Lake Shore & Michigan Southern." Before accepting this experiment as entirely conclusive of the relative performance of the engines, it should, it is thought, be checked by some other method. We say this because the committee themselves say that under some conditions of working it is "very difficult to keep the instrument in proper order without constant care." But the experiment at any rate shows how very important it is to have full and exact knowledge of what is done on a road. Without such an experiment one railroad company might compare its performance with another for years, and both show equally good results, and yet at the same time the one be wasting 50 per cent. of the locomotive power by reason of inefficient working of the engines, and the other waste the same amount in the increased resistance of trains on a rough track. It is very much like finishing a straight edge: every skillful mechanic knows, or should know, that two straight edges may be fitted so that they will conform to each other exactly, and yet neither be true, because the one may be concave and the other convex, and the convexity of the one may compensate for the concavity of the other. If, however, a third one be made and fitted to each of the two first the error, if there be one, will soon be made apparent.

It is difficult to draw any conclusions of much practical value from the table of resistances which is published, because the conditions under which the experiments were made were so various. They could very easily be plotted graphically, and the law, if there be one, of the resistance of the cars experimented upon be deduced thereby. These experiments, however, need to be extended very much, and to be made with reference to especial points to be



DYNAGRAPH MEASUREMENTS OF RAILWAY RES



RESISTANCES: BY P. H. DUDLEY, C. E.

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elucidated. Every railroad manager at all interested in the science of his profession must, we feel sure, desire that Mr. Dudley should be enabled to continue and complete them.

It of course could not be expected that a committee could give the necessary time to making a series of exhaustive experiments, and therefore, as we pointed out in our article published some months ago, in making such researches the committee must employ and pay an expert to do the work under their supervision. This we hope they will be able to do, and thus a "Committee of Experimental Research" will be established, which, it is believed, could be made very effective in the hands of competent persons, such as the members who have been appointed by the mining and civil engineers to consider this subject of train resistances.

THE BALTIMORE & OHIO AND THE RAILROAD WAR.

We have endeavored, so far as possible, to trace the effect of the railroad war on traffic, from week to week; another effect which is still more important, considering the object of the contest, or its supposed object, is its effect on the railroad companies involved. If a "war" is to be successful, it must be by hurting one or more of the parties to it until they are willing to make peace on terms which before the contest they would not have consented to. Unfortunately, we lack data for any general study of this effect, for the railroad companies involved do not publish monthly reports of earnings in detail. We have had a statement of Lake Shore & Michigan Southern earnings for the first half of the year; but the low rates did not prevail for much more than one-third of that period, and the returns were not made for the main line separately, so that we could only guess how far any change was due to the lower rates of part of the season. So far, the May returns of the Baltimore & Ohio have been the most significant, and the value of these is increased by the statement of the earnings in June on the different lines, as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Main Stem.....	\$819,399 89	\$928,468 88	Dec..	\$109,068 99 11.7
Washington B'ch	30,789 32	27,914 44	Inc..	2,874 88 10.3
Parkersburg Branch.....	58,613 25	44,325 87	"	14,287 38 32.3
Washington Co. R. R.....	2,402 02	2,684 18	Dec..	282 16 15.0
Winchester & Potomac.....	6,311 73	9,332 16	"	3,120 43 38.4
Winchester & Strasburg.....	2,736 11	3,933 70	"	1,207 59 30.7
Harrisburg B'ch.	5,074 43	9,429 23	"	4,354 80 46.1
Strataville Div..	12,119 50	21,653 83	"	9,534 33 44.0
Lake Erie Div..	66,622 55	94,371 98	"	27,749 43 29.4
Can. Ohio Div..	66,130 60	78,313 61	"	12,183 01 15.5
Chicago Division	99,211 80	110,424 43	"	11,212 63 10.1
Wheeling, Pitts., & Baltimore...	3,596 84	2,722 67	"	125 83 3.4
Total.....	\$1,172,898 04	\$1,334,572 68	Dec..	\$161,674 64 12.1
Pittsburgh Div..	140,113 50	184,974 29	Dec..	44,860 79 24.3

Total with Pitts. Div. \$1,313,011 54 \$1,519,546 97 Dec.. \$206,535 43 13.6

Thus the only lines showing an increase are the Washington Branch (which now gets, perhaps, the largest part of the through travel) and the Parkersburg Branch. The total decrease of 12 per cent. is a large one, and is probably due wholly due to reductions in the through rates and a decrease in the amount of local traffic, as the amount of through traffic carried was probably greater than in any previous year for the same month. Particularly noticeable are the very large decreases on the lines which have scarcely any other than a local traffic, and it is not easy to see why this should be; but some parts of what form the through lines to Chicago, St. Louis and Cincinnati also show large decreases—the Central Ohio 29½ per cent., the Lake Erie Division 29½, and the Chicago Division 15½ per cent. The decrease of 11½ per cent. in the Main Stem is probably chiefly due to the decline in the Cumberland coal traffic.

The sources of the total earnings, including those of the Pittsburgh Division, were:

	1876.	1875.	Decrease.	P. c.
From passengers.....	\$268,801 96	\$370,583 63	\$101,781 67	27.5
From freight.....	1,044,209 58	1,148,963 34	104,753 76	9.1

Thus the loss on passengers appears to be nearly as great as that on freight, which was hardly to be expected; for the passenger traffic of the Baltimore & Ohio is comparatively light, and less of it than on the other through lines is through traffic; and so less should be affected by the low rates. Moreover, through passenger rates were not very much lower this year than last, (about one-sixth on the average) so that it is not possible to account for the decrease of 27½ per cent. in passenger earnings without a large decrease in passenger traffic. If the decrease has been in through passengers, perhaps the company is the better for it, as it could hardly make profits on this business at current rates; but a decrease in local passenger earnings would be wholly a misfortune. The report shows in fact that just about the entire decrease in passenger earnings has been on those lines which carry the through traffic. On the others the gains very nearly balance the losses. This, of course, does not prove that the loss was wholly in through traffic, but it makes it probable that most of it was due either to a decrease in this traffic or to a decrease in the traffic coupled with the decrease in the rates; so that the average profit on passengers may have been greater than last year.

Consolidating the returns for May and June, we have:

	1876.	1875.	Decrease.	P. c.
May.....	\$1,363,994 11	\$1,414,972 59	\$51,278 48	3.6
June.....	1,313,011 54	1,519,546 97	206,535 43	13.6
Two months.....	\$2,676,705 65	\$2,934,519 56	\$257,813 91	8.8

Last year June showed a large increase over May; this year there is a small decrease.

Of course it is impossible to say what the effect of these decreased earnings will be without knowing the working expenses. If these are as great as last year (probably they would be less if the volume of traffic were not larger), the net earnings are decreased by the same amount as the gross earnings. The rate of decrease for May and June, if it extended throughout the year, would amount to \$1,270,000, or nearly 10 per cent. on the stock. But, so far as the current fiscal year is concerned, the company must have done better and not worse than during the preceding year until May, carrying, as it did throughout the winter, when the weather was favorable to economy and prices were remunerative, a larger traffic in grain than ever before. Should there be a reduction at the rate reported for the two months for the part of the fiscal year after April (five months), it would amount to something like \$600,000, or about 4½ per cent. on the stock. This, however, is not one-seventh of last year's net earnings. The dividends of the Baltimore & Ohio last year did not absorb a third of its net earnings, and the interest on its own bonds (less its receipts for interest) not half so much; but about \$800,000 was absorbed in rentals, etc. It is not impossible that the gains of the first seven months of the year may balance or more than balance the losses of the last five, even if the latter should continue to show a decrease as great as that of the two months reported.

It does not seem probable that expenses have been or will be reduced this year below those of last year, because the traffic must have been much heavier this year, or at least the grain traffic must have been. There has been a decrease in the coal traffic, however, and, as we have shown, there may have been savings in passenger expenses.

It would not be worth while to speculate over these returns, perhaps, but for the fact that the Baltimore & Ohio is supposed to be a chief defensive party in the railroad war; and its readiness to accept any different policy than that preferred by it when the struggle broke out (if the war is to have any effect) will be expected to depend on the extent of its losses. The company is counted an exceptionally strong one, by reason of its small capital stock and direct funded debt; but its obligations for rentals, etc., are considerable, and a reduction of 9 per cent. in the receipts of last year would equal the entire amount of the 10 per cent. dividends.

This year the interest account will be somewhat greater than heretofore, but last year the accounts showed a surplus considerably greater than the whole dividend account.

If this surplus were available or could be made available, and did not consist chiefly in advances for indispensable improvements or to pay interest for leased lines or deficits in their working expenses, then the company's position is really very strong; but if nearly all the available surplus was needed to make out the dividend last year, then the company may suffer seriously by a not very large reduction of net earnings. The latter were less last year than for any preceding year since 1870-71, though the funded debt in that time increased from \$11,886,000 to \$32,728,000; and the "surplus" (nearly all invested in tributary railroads) from \$23,247,000 to \$34,070,000. That is, the addition of more than thirty millions to the investment has not resulted, so far, in an increase of the profits.

It has, however, resulted in a very large increase in the commerce of Baltimore. Nearly all extensions of this road have been to places which previously Baltimore did not reach, or did not reach effectively. The Baltimore & Ohio's competition was not with other roads carrying to Baltimore, but with other roads carrying to Philadelphia, New York and Boston. Consequently through it Baltimore business has been increased at a time when there was no or very little growth in the general traffic of the country. Thus, whatever may have been the effect on business elsewhere, on the transportation interests, and on the proprietors of the Baltimore & Ohio Railroad in particular, the city of Baltimore has profited by the policy of extension. Whether the new lines are profitable or the reverse, they at least carry some traffic, and they carry their traffic to and from Baltimore, and what they carry is usually just so much added to Baltimore business. The effect is thus quite different from that of a new line from New York to Chicago or Philadelphia to St. Louis. Such a line, like the Baltimore & Ohio extensions, would have diverted traffic from the old lines; but it would not have diverted it from the old sea-board markets. Whatever its success as a carrier, it would not have benefited, or would have benefited very little, any community, nor would it have injured any large city; but the Baltimore & Ohio's new lines take business from New York and Boston and give it to Baltimore. They not only increase the competition among railroads, but they introduce a new competition among markets, and thus have a greater and a wholly different disturbing effect.

The Fast Mail Trains.

The fast mail trains, after having run something more than ten months, and with most remarkable success, will make their last trips this week, no appropriations having been made to pay for them. The treatment of the companies running these trains has been very much like the previous course of Congress with regard to the transportation of mails. Whenever a man of intelligence and enterprise has happened to slip into the post-office service, he has looked about for an opportunity to improve that service, as, some years ago, by the introduction of post-office cars, so that the mails might be distributed while on their way, and in this last case of special trains running at extra speed composed entirely of post-office cars. In these cases, the improvements in the service required of the railroad companies a large addition to the facilities heretofore provided, at a considerable (in some cases a very large) addition to their expenses. Now the officers of the post-office department seem never to have entertained the idea that they could obtain an appropriation from Congress to pay for an improvement in the service before the improvement had been introduced at the expense of some one else, and had become known to and valued by the community. Consequently, when they have had these new ideas, they have gone, not to Congress but to the railroad companies to secure their introduction. They have said, substantially, "Here is a good thing which ought to be adopted, but which Congress will not give any money for until it has been tried and proved to be good. We can't pay you anything now for doing the new work; but if we once get it started, it will become indispensable to the community, and we will recommend strongly to Congress an appropriation sufficient to pay you a profitable price for the service, and it will probably be granted." The remarkable thing is that the railroad companies have consented, and so have really paid the cost of experiments in the postal service which Congress had made no provision for whatever. But in both the cases we have named the influence of the Post-office Department in securing from Congress payment for the improvement, even after it had been introduced and had become well nigh indispensable, seems to have been next to nothing. Year after year the railroads hauled post-office cars at most unsatisfactory rates, and, getting recommendations yearly from the Post-Master General, never were adequately relieved. In the teeth of this experience they put on the fast mail trains; and now Congress, as a reward, cuts down the appropriations for transportation.

It is probable, however, that when the fast mail was put on there was a fair prospect that it would be made profitable by the concentration of mails on one road even at the rates then paid for ordinary post-office car service. One line carrying all the mails which had previously been divided between two or three or more might make a profit out of a business which, divided as it had been, was theretofore unprofitable. But if a fast mail train is to be profitable there should be but one; and when both the New York Central and the Pennsylvania put on such trains, the possibility of making either profitable was greatly lessened.

Whatever the inconvenience resulting from the withdrawal of these trains, it is to be feared that the displeasure of the public will be directed, not to those really responsible for it, but to the very railroad companies whose chief fault in the matter is that they ventured to pay the cost of improving a service for a year in the hope of receiving some compensation thereafter. They should remember that when people have been indulged with gratuities for a series of months they come to consider them as their due, and are indignant if they are withdrawn.

The Grain Movement for Eleven Weeks.

The shipments of grain of all kinds from the eight principal Northwestern markets for each week since April 22 have been, in bushels, by lake and by rail:

Week ending—	By lake.	By rail.	Total.	Per ct. by rail.
April 20.....	1,634,541	2,072,946	3,707,487	56
May 8.....	2,445,191	2,292,633	4,737,824	48½
" 13.....	1,538,826	2,302,940	3,841,766	60
" 20.....	1,692, 70	2,016,304	3,618,474	55½
" 27.....	1,747,408	1,820,456	3,567,864	51
June 3.....	2,412,162	1,797,922	4,210,084	42½
" 10.....	2,894,915	2,147,570	5,042,485	42½
" 17.....	2,921,405	2,391,811	5,313,216	45
" 24.....	2,728,706	2,198,064	4,926,770	44½
July 1.....	1,821,155	1,784,548	3,605,703	49½
" 8.....	1,765,010	1,305,184	3,070,194	40½
Total for 11 weeks.....	23,511,189	22,030,468	45,541,657	48½

The movement is the lightest of the season, due partly to the holidays, partly, doubtless, to the reduction of stocks, as the farmers were and for some weeks will be too busy to carry grain to market, if they have remaining any considerable stocks to sell, which is not very probable. The decrease has fallen almost entirely on the railroads, though apparently the water rates were the same as for the previous week, amounting to 2½ to 2¾ cents for wheat and 2 cents for corn by lake and to 6 to 6½ for wheat and 5¼ for corn per bushel by canal. Since that week water rates have been lower, with no reported change in rail rates, wherefore it is natural to suppose that the vessels will continue to carry most of the grain.

The receipts at the different Atlantic ports for the same eleven weeks have been:

	Corn.	Per cent. of total.	All grains.	Per cent. of total.
New York	6,193,624	25.1	21,598,299	44.7
Boston	2,670,725	10.8	3,702,249	7.6
Portland	178,100	0.7	461,370	1.0
Montreal	1,177,369	4.8	4,712,427	9.7
Philadelphia	6,896,100	28.0	9,261,350	19.2
Baltimore	6,352,500	25.8	7,063,285	14.6
New Orleans	1,176,166	4.8	1,533,246	3.2
Total	24,644,586	100.0	48,331,926	100.0

During the last week, New York received 28.5 per cent. of the corn, Philadelphia 27.8, Baltimore 21.5 per cent. Of all grains New York received 42 per cent., Montreal (for the first time ranking second) 18 per cent., Philadelphia 17 per cent., Baltimore 13½ per cent. In receipts of all kinds of grains, since the previous week, Montreal alone has improved its position, Portland and New Orleans remain unchanged, the other places have lost what Montreal has gained.

In corn receipts, however, New York has improved its position, and is now but little behind Baltimore; Montreal also has improved, Portland, Philadelphia and New Orleans remain unchanged, while Boston and Baltimore rank lower than last week.

We can hardly expect to have a heavy movement again until after harvest, and unless the season is favorable for threshing as well as harvesting, not until September. Whether it will be heavy then or not will depend somewhat on the amount of the crop, but more on the European demand. Last year the Fall movement was quite light, though there were smaller shipments than usual from California to stock foreign markets (having about two months' start of Northwestern grain); this year California will have an effect on the market which may reduce the movement from the Northwest, unless farmers there are very anxious to market their crops, as they are not accustomed to be when prices are low. However, should there be a European war involving some of the great powers, the movement would probably be as heavy and as rapid as transportation facilities would permit, and under circumstances which would probably compel high rates for transportation.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Delaware Shore.—Extended from Paulsboro, N. J., southwest to Pennsgrove, 15 miles.

St. Louis, Bloomfield & Louisville.—Extended from Bloomfield, Ind.; southeast to Bedford, 29 miles. It is of 3-ft. gauge.

Little Rock & Fort Smith.—Extended west 28 miles to Cherokee, Ark., completing the road.

Gulf, Colorado & Santa Fe.—Extended 5 miles to a point 15 miles west of Galveston, Tex.

Texas & Pacific.—Extended from Mountain Creek west 7 miles to Hayter, Tex.

California Pacific.—The *Tehama Branch* is extended north 29 miles to Williams, Cal.

This is a total of 106 miles of new railroad, making 846 miles completed in the United States in 1876, against 457 miles reported for the same period in 1875, 727 miles in 1874, and 1,578 in 1873.

Russia seems to find Europe able to supply it with anthracite-burning locomotives now. The Belgian *Moniteur des Interets Materiels* of July 2 says that the Creusot Works, in France, have taken a contract for supplying locomotives for the coal roads of the Donetz valley. They are to weigh, with tender, 30 long tons, and are furnished at 47,500 francs each—say \$9,200 gold or \$10,350 currency. The *London Mining Journal* says that this is the lowest price ever known for engines of the kind, which may be true for Europe, but locomotives of that weight may be had in abundance in this country for no more; though that they are similar, or equal in material or workmanship, cannot be affirmed in the absence of the specifications.

LAKE FREIGHTS last week were reported lower than ever before, we believe, the commonest quotation for corn from Chicago to Buffalo (and the shipments are chiefly corn) being 1½ cents a bushel, which is at the rate of about 0.06 cent per ton per mile. At the same time sailing vessels receive for carrying corn from New York to Liverpool, about three times as far, as much as 18 cents a bushel.

THE UNITED STATES INTERNATIONAL EXHIBITION.

IX.

SAW MILLS.

The circular saw mill of to-day is in a high state of development, and indeed there seems to be little room for any great improvement of the machine, as now manufactured at first-class establishments. The practice of the leading manufacturers of this country, and a single Canadian builder, is well illustrated at the Exposition; and the two annexes devoted to the display of saw mills should be thoroughly inspected by all who are interested in the lumber business. The visitor will find most of the exhibits in charge of courteous and intelligent attendants, to whom the writer wishes to render his acknowledgments for the kindly and thorough manner in which his desire for information was met. An attempt is made in this article to give a brief description of the leading characteristics of each mill, as far as they can be rendered intelligible without the aid of engravings. While it is possible that no single mill on exhibition would be considered perfect by the over-critical lumberman, the most particular sawyer could doubtless construct a machine to suit his taste, by using separate parts of the different exhibits, and it may be useful to class the prominent features of each. As a general thing separate portions can be purchased by those who do not desire a complete mill, and this classified description may be of service to some who wish to improve old mills. For instance, a new set of head-blocks, carriage irons, dogs, or the like, may some-

times be used to advantage on an old-fashioned mill, the other parts of which are too good to throw away. For convenience of reference, a list of the exhibits is given below, numbered in the order of their arrangement in the annexes, and these numbers will characterize them in the following description:

CIRCULAR MILLS IN SAW MILL ANNEX.

1. Lane Manufacturing Company, Montpelier, Vt.
2. Stearns Manufacturing Company, Erie, Pa.
3. A mill without attendance, not completely set up, and exhibitor's name not given.

4. Chase Turbine Manufacturing Company, Orange, Mass.
5. Waterous Engine Works Company, Brantford, Ontario.
6. Reliance Works, Edward P. Allis & Co., Milwaukee, Wis.
- 7.—Lane & Bodley, Cincinnati, Ohio.

IN A SPECIAL ANNEX.

8. E. W. Ross & Co., Fulton, N. Y.
- A band-sawing machine, with a saw 9 inches wide, exhibited by C. Meiners, of Philadelphia, is not completely erected, and can be better described on some future occasion. About the middle of the saw mill annex, the visitor will find the Pacific Coast Steam Logging Saw, exhibited by S. Scholfield, of Providence, R. I. This is a cross-cut saw, joined by connecting rods and cranks to the shaft of what seems to be a small rotary engine, evidently intended to create a commotion when put to work among the trees. There are a few other exhibits of special sawing machines in this annex; but it may be well to return to the description of circular mills.

MANNER OF DRIVING THE MILLS.

Mills 5, 6, 7, 8 are represented with the engines such as are ordinarily furnished to drive them, and the others are connected by belts to the line shafting in the annex. The different methods of connection with the engine seem worthy of a few remarks. A common arrangement is to belt from the band wheel of the engine to the pulley on saw arbor, and this plan is adopted in 7 and 8. In two-story mills, where the driving machinery is below, and the mill above, it is not uncommon to drive from the engine to a countershaft, and from the countershaft to the saw. This is the arrangement of No. 6. No. 5 presents a somewhat unusual connection, the saw arbor being a continuation of the engine shaft, so that the engine makes as many revolutions as the saw. It is evident that, the more direct the connection is made, the smaller will be the engine that is required, and the less the outlay for belts. On the other hand, there are some advantages, in the opinion of many, in an engine working at a moderate speed, even if it must be larger. Below are the dimensions of the engines:

5. Revolutions of engine and saw per minute, 500 to 600. Cylinder, 8½ × 10. Diameter of saw, 54 inches.
6. Revolutions of engine per minute, 125. Revolutions of saw per minute, 750. Cylinder, 16 × 24. Diameter of saw, 56 inches.
7. Revolutions of engine per minute, 180. Revolutions of saw per minute, 700. Cylinder, 10 × 20. Diameter of saw, 54 inches.
8. Revolutions of engine per minute, 200. Revolutions of saw per minute, 500. Cylinder, 10 × 10. Diameter of saw, 54 inches.

The engine exhibited in connection with this saw mill is manufactured by B. W. Payne & Co., Corning, N. Y. The other engines are furnished by the builders of the respective mills.

SAW FRAMES.

When large or crooked logs are common, it frequently happens that a large saw is necessary in squaring the log, which can afterward be cut up into boards with a saw of comparatively small diameter. In such cases it may be advantageous to use a double mill, having a top saw which can be put in motion when necessary. Both single and double mills are represented among the exhibits, but probably any of the manufacturers would furnish either style to order. So, also, both wooden and iron saw frames are exhibited, and either kind would probably be supplied to a purchaser, as desired. It seems to be a disputed question among lumbermen as to which kind of frame is best, especially for a portable mill; and the writer's experience leads to the belief that either will answer very well.

TRACK IRONS.

The old saw-mill carriage had small pulleys, guided on one side on a V-shaped track, and usually constructed with such insufficient bearings and such imperfect facilities for lubrication that a carriage running properly after a little use was the exception rather than the rule. The modern mill shows a great advance on the old practice. If small pulleys are used, they are generally placed on the ways, where they can speedily be inspected and lubricated, and the tracks are secured to the carriage. This is the plan adopted in mills 1 and 7. Mills 3 and 4 have small pulleys on the carriage, not showing a very decided improvement on old practice. The remaining exhibits have pulleys of large diameter on the carriages, with large bearing surfaces in the journals, and mills 2 and 5 have, in addition, V-shaped guides back of the pulleys on one side, fitting over the track, to aid in keeping the carriage in line. In setting the track, or adjusting the saw arbor, it is usual to allow a little off-set, so that in gigging back the saw will not strike the log; and no first-class mill of the present day turns out lumber marked by return strokes, so to speak, of the saw.

MOTION OF CARRIAGE.

In feeding the lumber to the saw, the old clutch motion is discarded, and all the mills on exhibition use the friction feed, in which a small pulley on the feed shaft is pressed against a pulley on the pinion shaft, commonly called the rag wheel, and so communicates motion to this shaft by the friction between the two pulleys. In all the mills the rag wheel is of cast iron, and the friction wheels on feed shafts of Nos. 1, 2, 5 and 6 are covered with paper; those of 4 and 8 are made of wood, No. 3 has an iron friction wheel, and that of 7 is covered with leather. Most of the mills have cone pulleys

on feed shaft and saw arbor, so as to change the feed at pleasure, but 2 and 6 have unusually wide feed belts and single pulleys, so that a change of feed is produced, when desired, by allowing the friction wheel to slip somewhat. It may be remarked that mills 2 and 6, especially the former, are noticeable for the wide belts used, apparently of ample width to force the saw up to full capacity if sufficient power is employed. The same lever that is used to apply the friction feed, if moved the other way, brings into operation the mechanism for gigging back, in all the mills, either by tightening a belt from saw arbor to pinion shaft, bringing a friction pulley into contact with rag wheel and outside of saw belt, or making contact of a friction pulley with the rag wheel and a pulley on saw arbor; all these methods being illustrated in the different mills.

HEAD BLOCKS.

It is in the set-works of the various mills that the greatest ingenuity and inventive skill are displayed, and no one, whether a professional sawyer or not, can well fail to be interested in witnessing the motions and examining the details. It is feared, however, that the description cannot be made very intelligible without the aid of illustrations. The principal objects sought to be accomplished with all the set works on exhibition, and the methods employed for the same, are as follows:

1st.—To arrange the head-blocks so that they can all be set up the same distance, by the movement of a single lever, or so that one can be advanced farther than the others, if necessary, as in the case of a crooked log. Two general systems of producing this effect are illustrated in the saw-mill exhibits. In one plan, the uprights of the head blocks are secured to a plank which slides up on the head blocks, the latter having racks upon them, into which are geared pinions on a shaft attached to the plank, so that by turning this shaft the uprights are caused to advance. If it is desired to throw out one portion of a log farther than the rest, a lever on the upright at that point is moved, which advances a sliding piece, and it is held in position by a pawl on the lever which moves on a toothed arc. This is the plan adopted with mills 1, 4 and 5, No. 1 having, in addition, a lever near the front end of the carriage, by means of which the sliding piece can be thrown out on a distant upright. The head-blocks being placed quite close together, with this form of set-works, long or short logs can be sawed with equal facility.

In the other form exhibited, two or more head-blocks are used, and they are so connected by gearing or rack work that the uprights all advance together when a single lever is moved, while all but one can be thrown out of gear at pleasure, so that only the one remaining in gear will be influenced by the movement of the lever. After the log is squared, it is of course necessary to have all the uprights in line, and the one that has been advanced must be brought back to the same distance from the end of the head-block as the others. Mill 3, as far as could be observed, has no arrangement for moving one upright independently of the others. With mills 1, 4 and 5 it is only necessary to release the lever which throws out the sliding piece from the upright. As the uprights of No. 2 are moved forward, spiral springs on the connecting shaft are coiled, so that if one upright has been advanced beyond the others, on releasing a catch it will spring back to its proper position in line. In No. 6, the upright that has been advanced is brought back by a lever, there being a stop for the lever, so as to leave this upright in line with the others. With the other mills, each head-block can be moved back independently by a hand wheel, and its proper position ascertained by means of figures in the head-block. It may be added that the head-blocks of all the mills are marked off in inches and fractions. The head-blocks of No. 2 are "winged," or spread out so that it will take a considerable length of the log.

2d.—To arrange the set-works so that lumber of any desired thickness can readily be sawed, the log be set without calculation, and the uprights quickly adjusted for a new log.

To regulate the movement of the uprights by that of the controlling lever the latter either engages more or less teeth of a wheel in its movement, or has its throw altered by regulating stops. In mills 1 and 5, there is an upright roller on the front of the saw frame, which can be moved over a scale to any desired distance from the saw; and if the log is brought up against it each time the carriage is gigged back, the next cut will take off a board of the requisite thickness. In No. 8, there is an automatic setter, by which the log is moved out the required distance as it advances towards the saw.

After a log is cut up, it becomes necessary to run back the uprights, and of course it is advantageous to perform this operation as quickly as possible. In Nos. 1 and 6, the sawyer presses a lever, as the carriage is running back after the last board is removed, and brings a friction wheel into gear with a wooden slide, which runs the uprights back as far as is requisite. The spiral springs already mentioned in connection with the set works of No. 2 draw back the uprights instantly, on releasing a catch, the distance to which they are moved being regulated by racks, at any teeth of which the uprights can be stopped. In mills 3, 4, and 5, the reverse motion is imparted to the uprights by means of the same lever which moves them forward; and in the other two, each upright is run back by an independent hand wheel.

By constructing the teeth of the setting wheels so that they move by regular fractions of an inch, whenever a log is squared the uprights can readily be adjusted so that it will be sawed up into an even number of boards, all of the same thickness.

3d. To provide efficient means for holding the log while it is being cut up.

In No. 1, there are heavy dogs on upright screws, which can be run into the log by hand wheels; and dogs for holding the last board are attached to several of the uprights. Similar last-board dogs are shown with mill 3. The uprights of No. 2 carry a number of dogs hung on pins, one of which will take a log of almost any size, the others turning out of the way, and the

one that takes being forced into place by the action of a long lever. For the last board a number of short curved dogs, that are ordinarily flush with the front surface of the uprights, are thrown out and made to engage the lumber by the action of a lever. No. 4 has heavy dogs sliding on upright shafts, which are forced into the log by allowing them to drop, and by reversing them they secure the last board. No. 6 has short curved dogs which can be thrown out some distance in advance of the upright, and on moving a lever they are forced into the log and draw it towards the uprights. For the last board, these dogs are drawn back so as to be almost flush with the uprights, and are then forced, by the lever, into the log. Back of the uprights on mill No. 7 are heavy curved dogs, which can be turned round into any desired position by hand, and revolved downward into the log, by a hand wheel. No. 8 has heavy dogs which are forced into the log by a long lever, and this mill has an arrangement by which a log can be dogged both above and below, and raised up clear of the head-blocks, thus being held securely for sawing through and through without squaring. Several of the mills have under dogs, for the purpose of securing crooked or springy logs.

DEVICES FOR TURNING THE LOG ON THE CARRIAGE.

There are numerous arrangements of this kind in common use, but only two are shown at the exhibition. Both of these, however, will probably present novel features to many lumbermen. In mill No. 2, by pressing a lever a toothed wheel rises from the log deck, and its teeth engaging the log on the carriage as it revolves, the log is turned into any desired position. No. 6 has a lever on the carriage, with a dog at the end, and this being forced into the log, the latter is forced to revolve by the movement of the lever.

LOG HAULER.

In connection with mill No. 2 there is shown an arrangement for hauling logs out of the ship, consisting of an endless chain running down into the water and constantly in motion. Having driven a dog into the log, it is only necessary to hook this to the endless chain, and the log will be hauled up, all necessity of carrying down the chain for each log being obviated. No. 6 has a car, running on a track, upon which the log is hauled up by means of a rope or chain.

In order to keep this communication within proper limits, it has been necessary to omit many interesting details; but is hoped that the reader will be able to form some idea of the prominent characteristics of the different mills on exhibition. It only remains to say, that if any one is thinking of purchasing a saw-mill, he will find the two annexes at the exposition excellent places in which to make his selection.

NEW PUBLICATIONS.

We are indebted to Mr. J. E. Ward, the General Manager, for a copy of the "Tourist's Handbook and Angler's Companion," issued by the Midland Great Western Railway Company, of Ireland. British railroads have an enormous excursion traffic, and the art of cultivating it has been carried to greater perfection there, perhaps, than anywhere else in the world; so that an examination of the publications used there is interesting to foreign railroad men. The guide in question is a pocket pamphlet of about a hundred very small pages with maps and some wood engravings of picturesque scenery, and one of that peculiar Irish institution, the "jaunting car." We note first in the book, what is too often lacking in such publications, an index and a condensed time table. "Cheap circular tours" are among the trips advertised, tickets for which are issued from June 1 to Oct. 31, are available for a month, are not transferable, and are sold at rates which decrease with the number taken—evidently to attract families and parties.

For instance one first-class ticket for the Connemara and Kilkenny circular tour costs 61s. 6d., but two can be had for 110s. 6d., three for 155s. 6d., and six for 257s. 6d., the latter number being at the rate of 42s. 11d., a reduction of 32 per cent. on the rate for a single ticket.

Another feature is the schedules of short tours—four days, a week, ten days, fourteen days—in which the routes off the railroad as well as those on it are so described as, apparently, to leave to the intending tourist little more planning to do than to select his tour. For instance here is Tour No. 1, headed "Mountain Scenery," with the note that "H" indicates that there is a hotel at the place.

"1st day.—Train, 9 a. m., to Galway H; walk to Claddagh or drive to Salthill. 2d day.—Steamer, 3 p. m., to Cong H, on Lough Corrib, 20 m.; visit Caves and Abbey (A. D. 1120). 3d day.—Public Car through Ashford desmone and along Lough Corrib to Glendalough H (via Maam H), 26 m. 4th day.—Hired Car to Letterfrack H, 14 m., skirting Twelve Pins Mountains (2,300 ft.), and through Kylemore Pass. 5th day.—Hired Car through Sal Ruck Pass, or by public car direct to Leenane H, 12 m., skirting shore of Killery Bay. 6th day.—Public Car to Westport H, 15 m., along the pretty valley of Erriff River. 7th day.—Drive to Croagh Patrick (2,510 ft.) and Murriak Abbey; Train, 9 p. m. to Dub. in."

A note is subjoined which says that "by taking the steamer on first day, omitting Letterfrack, and proceeding direct to Leenane on third day the tour can be made in four days." This guide has also considerable matter descriptive of the country, which seems to whet the appetite for the tour.

Recording the Wear of Wheels.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Since the yearly consumption of wheels on our railroads has become so very large, it is plainly the duty of those in charge of their examination and renewal to leave no means unturned of detecting and also of recording the progress, and the causes of the failures and removals.

You have remarked frequently upon the great indifference of many buyers of wheels as to the real quality obtained by them, and of course to such no urging of any kind, or suggestion of better or additional methods of record, will be of much interest or of any value.

Even to these, however, and certainly to those who do care to get their money's worth in full, there may be some attrac-

tion in a simple method, though it can hardly be called new, of obtaining and preserving the exact contour or cross section of the tread of a wheel, as it gradually changes under the wear to which it is subject.

This can be very perfectly done by making a plaster cast of the tread, including the side of the flange, for a distance say of six inches along the circumference. From this negative, as it may be called, a positive cast can be even more easily made which will give the exact outline of the wearing face of the wheel.

In order, however, to obtain the precise cross section, a mark will have to be made upon the negative mould, corresponding in exact position to a radius of the view of the wheel, and from this a corresponding line can be drawn on the positive cast of the wheel tread. To this latter line the cast can be closely trimmed by suitable plaster-working tools, so that one face shall show, to a minute fraction of an inch, the cross section at the point determined by the radial line already drawn.

It is obvious that by comparing two casts, made in this way at different times, the exact progress of the wear of the wheel may be seen. It is also clear that for even closer comparison the casts may be laid, one after the other, on a paper and the outline drawn with a sharp-pointed pencil with the utmost exactness, so that by this means the record may be kept in two ways, one appealing to the sense of touch in the actual solid, as well as to the sense of sight.

It is quite certain that a collection of such casts will have in a large degree the same interest that attaches to the ethnographical collections of casts of human faces, which in so many places challenge the attention of visitors to our museums, and through which, to the trained eye, many connecting links can be traced between nationalities, that are not apparent when single faces are studied by themselves.

It may be urged that this is (1) a needless and costly refinement, (2) a suggestion wholly theoretical as far as any real use or value is concerned (3), quite impracticable to be put into daily or even occasional use, and (4) that, even if it can be kept, this kind of a record is of no value for preservation.

In reply to this it may safely be held that (1) there is no refinement in the idea or in the method proposed that is beyond the capability of a very junior draftsman or a fair account clerk; that (2) suggestions far more theoretical than this have proved to embody, when fairly carried out, a surprising amount of information bearing directly and unexpectedly upon the conditions of practice; (3) that the plan need be put into use only for the measurement of characteristic wheels; or for certain classes or lots, and that (4) what the engineering world as a whole now needs, almost more than anything, is the careful and patient collection of facts, such as would be shown, for example, by this very method in wheels—the interpretation of the vital result thus shown being one of those things which, if need be, may for a time be left.

Asking permission to return to this subject at another time, I remain, P. BARNES.

[Why would not a simple template cut out of a thin piece of wood so as to fit the tread of the wheel answer as well as a plaster cast?—EDITOR RAILROAD GAZETTE.]

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Portsmouth, Great Falls & Conway.—At the annual meeting in Portsmouth, N. H., July 11, the following directors were chosen: Ichabod Goodwin, W. H. Y. Hackett, Portsmouth, N. H.; G. W. Burleigh, Great Falls, N. H.; F. W. Choate, Beverly, Mass.; Robert W. Hooper, Boston. The board elected W. H. Y. Hackett President; Wallace Hackett, Clerk. The road is leased to the Eastern.

Eastern, of New Hampshire.—At the annual meeting in Portsmouth, N. H., July 11, the following directors were chosen: Moody Currier, Manchester, N. H.; Dexter Richards, Newport, N. H.; Edward L. Giddings, Beverly, Mass.; Walter Hastings, Francis Thompson, Boston. This is an entirely new board. The board elected Moody Currier, President; Thomas J. Lee, Treasurer; Wm. H. Y. Hackett, Clerk. The road is leased to the Eastern, of Massachusetts.

Peoria & Farmington.—The following officers have been chosen: President, Wm. R. Bush; Vice-President and Treasurer, W. E. Stone; Secretary, G. L. Beater; Attorney, R. G. Ingersoll; Superintendent, E. Jamieson.

Buffalo, New York & Philadelphia.—Mr. Wm. Robinson has been appointed General Superintendent, dating from July 10, in place of J. D. Yeomans, resigned.

St. Louis, Kansas City & Northern.—Mr. George P. Maule is appointed General Baggage Agent, to date from July 15.

Great Western of Canada.—Mr. W. H. Pirth, for many years connected with the passenger department of the Chicago, Burlington & Quincy Railroad, has been appointed Western Passenger Agent, with headquarters at Detroit, Mich., vice J. D. Foster, resigned, who assumes a position on the Michigan Central.

Belfast & Moosehead Lake.—At the annual meeting in Belfast, Me., July 5, the following directors were chosen: C. B. Hazeltine, Daniel Faunce, Wm. M. Woods, Philo Hersey, John W. White, Josiah Mitchell, Edward Johnson, Jona G. Dickerson, John G. Brooks. C. B. Hazeltine was chosen President and A. Faunce Treasurer. The road is leased to the Maine Central.

Hempstead & Sabine.—The officers of this company are: R. W. Crawford, President; H. L. Ranking, Secretary; R. R. McDade, Treasurer. The office is in Hempstead, Texas.

Mobile & Ohio.—Mr. Cecil Fleming is appointed Assistant General Superintendent, with headquarters at Mobile. Maj. E. S. Hosford has assumed charge of the Tennessee & Kentucky in addition to the Mississippi Division, with headquarters at Jackson, Tenn.

Chicago, Pekin & Southwestern.—Mr. W. L. Brown, of Chicago, is appointed Treasurer.

Cincinnati & Portsmouth.—Mr. H. H. Wellman has been appointed Superintendent of this road, now under construction. He has been connected with the Cincinnati, Hamilton & Dayton.

Chicago, Burlington & Quincy.—Mr. R. M. Miles is appointed Division Freight and Passenger Agent, with headquarters at Quincy, Ill., his division to embrace so much of the Galesburg

Division as is south of Galesburg, and the Quincy Division south of Ferris.

Logansport, Crawfordville & Southwestern.—Mr. W. P. Hama, late Auditor, has been appointed Treasurer. Mr. Wm. D. Ernst succeeds Mr. Hama as Auditor.

Washington City, Virginia Midland & Great Southern.—The Virginia State Court has appointed Mr. John S. Barbour, President of the company, Receiver in the suit begun at Alexandria last month.

Cleveland, Columbus, Cincinnati & Indianapolis.—Mr. D. Carmichael has been appointed Master Car Builder, with office at Delaware, O. He has been for some time Master Mechanic of the Cincinnati Division.

Delaware Shore.—Gen. W. J. Sewell, Superintendent of the West Jersey Railroad, has been chosen General Manager of this new road. The other officers of this company are: President, Samuel Hopkins; Secretary, D. B. Gill; Treasurer, S. T. Muller.

Houston & East Texas.—The officers of this company are: Paul Bremond, President; F. S. Timson, Secretary and Treasurer; Horace Cone, General Agent. The office is in Houston, Texas.

PERSONAL.

—Mr. John King, Jr., Vice-President of the Baltimore & Ohio, sailed recently for Europe on a short trip for the benefit of his health.

—Mr. E. B. Wakeman, Master of Transportation of the Chicago, Burlington & Quincy road, has been presented with a draft for \$1,000 by his friends on the Chicago, Milwaukee & St. Paul road, with which he was formerly connected.

—Mr. J. D. Yeomans has resigned his position as General Superintendent of the Buffalo, New York & Philadelphia road.

—Mr. S. S. Parker, late General Passenger and Ticket Agent of the Louisville, Cincinnati & Lexington road, was recently presented with a handsome silver and glass stand, costing \$300, by his friends on the road.

—Alfred Brush, Cashier of the general office of the Intercolonial Railway at Moncton, N. B., has disappeared and is believed to be a defaulter to a considerable amount.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:

Ten Months ending April 30:

	1876.	1875.	Inc. or Dec.	P. c.
St. Paul & Pacific, Main Line.....	\$486,020	\$360,656	Inc..	\$125,364 34.8
St. Paul & Pacific, Branch Line.....	271,981	258,570	Inc..	13,411 5.2

Six months ending June 30:

	1876.	1875.	Inc. or Dec.	P. c.
Atchison, Topeka & Santa Fe.....	\$1,040,165	\$872,640	Inc..	\$167,525 81.6
Atlantic & Pacific.....	611,298	562,751	Inc..	48,547 8.6
Calo & St. Louis.....	124,068	122,519	Inc..	1,549 0.4
Canada Southern.....	882,881	817,949	Inc..	64,932 60.8
Central Pacific.....	7,901,000	7,910,183	Dec..	9,183 0.1
Chicago & Alton.....	2,237,009	2,112,966	Inc..	124,043 5.9
Chicago, Milwaukee & St. Paul.....	3,960,185	3,992,441	Inc..	587,744 16.7
Denver & Rio Grande.....	197,195	173,645	Inc..	23,550 13.6
Illinois Central.....	3,548,601	3,466,076	Inc..	82,525 1.8
Indiana, Bloomington & Western.....	760,591	597,487	Inc..	173,044 28.8
International & Great Northern.....	567,947	590,096	Dec..	22,149 3.9
Kansas Pacific.....	1,367,677	1,492,664	Dec..	124,987 9.0
Michigan Central.....	3,465,484	3,195,038	Inc..	270,446 8.5
Missouri, Kan. & Texas.....	1,417,840	1,229,015	Inc..	188,825 15.4
Ohio & Mississippi.....	1,847,769	1,589,064	Inc..	258,706 16.3
St. Louis, Alton & T. H., Belleville Line.....	234,072	278,086	Dec..	44,014 15.8
St. Louis, Iron Mountain & Southern.....	1,729,043	1,642,949	Inc..	86,094 5.3
St. Louis, Kansas City & Northern.....	1,600,285	1,235,342	Inc..	364,943 29.6
Toledo, Peoria & Warsaw.....	608,385	429,415	Inc..	178,970 61.5

Month of June:

Atchison, Topeka & Santa Fe.....	\$187,331	\$109,896	Inc..	\$77,435 80.3
Atlantic & Pacific.....	106,600	97,100	Inc..	9,500 9.8
Baltimore & Ohio.....	1,374,898	1,334,573	Dec..	40,325 12.1
Calo & St. Louis.....	23,966	25,652	Dec..	1,686 6.5
Canada Southern.....	111,006	96,599	Inc..	14,407 15.0
Central Pacific.....	1,639,000	1,738,370	Dec..	99,370 5.7
Chicago & Alton.....	441,390	382,233	Inc..	59,157 15.5
Chicago, Milwaukee & St. Paul.....	877,571	742,168	Inc..	135,403 18.2
Chicago & North-west'n.....	1,237,853	1,052,890	Inc..	184,963 17.6
Chicago, Rock Island & Pacific.....	714,005	676,082	Inc..	37,923 6.6
Denver & Rio Grande, Main Line.....	34,626	335,329	Dec..	708 2.0
Trinidad Extension.....	7,719	.....	.....	.....
Illinois Central.....	614,484	602,505	Inc..	11,979 2.0
Indiana, Bloomington & Western.....	129,090	82,238	Inc..	46,852 57.0
International & Great Northern.....	66,407	75,374	Dec..	8,967 11.9
Kansas Pacific.....	229,087	277,783	Dec..	48,796 16.5
Michigan Central.....	533,170	484,447	Inc..	48,723 10.1
Missouri, Kan. & Texas.....	233,126	221,444	Inc..	11,682 5.3
Ohio & Mississippi.....	304,846	256,772	Inc..	48,074 18.7
St. Louis, Alton & Terre Haute, Belleville Line.....	37,178	36,315	Inc..	863 2.4
St. Louis, Iron Mt. & Southern.....	262,300	294,631	Dec..	32,331 11.0
St. Louis, Kansas City & Northern.....	228,720	178,333	Inc..	50,387 29.4
Toledo, Peoria & Warsaw.....	135,926	77,963	Inc..	57,963 74.3

First Week in July:

Atchison, Topeka & Santa Fe.....	\$38,917	\$21,193	Inc..	\$17,724 79.6
Chicago & Alton.....	80,488	87,079	Dec..	6,591 7.5
St. Louis, Iron Mt. & Southern.....	55,300	57,850	Dec..	2,550 4.1
St. Louis, Kansas City & Northern.....	46,188	25,595	Inc..	20,593 80.4

The St. Louis, Iron Mt. & Southern reports for several weeks traffic seriously interrupted by floods and wash-outs.

Lake & Canal Freights.

The lowest rates of the year are reported: 1½ cents a bushel for corn from Chicago to Buffalo, and, in the few cases reported, 2 cents for wheat, though most is taken "on private terms," and probably for less than 2 cents. The canal rates are lower, 5½ cents per bushel for wheat and 5½ for corn. Vessels have been chartered at Milwaukee to take iron ore from Escanaba to Chicago at 70 cents a ton.

Ocean Freights.

For the week ending with the 18th freights have been active and firm, especially for petroleum. Grain from New York to Liverpool ranged from 8d. to 8½d. by rail, and 9d. to 9½d. by steam, closing at the higher figure; by sail to Cork for orders the rates were 10½d. to 10¾d. Cotton by sail from New York to Liverpool was taken at 9-32d., from New Orleans by steam

at $\frac{1}{2}$ d. Flour from New York to Liverpool, 3s. per barrel by sail, and 4s. by steam. Cargoes of petroleum were taken from New York to Antwerp at 5s. $\frac{1}{2}$ d., to Havre at 5s. 3d.; from Philadelphia to Havre at 5s. 6d.; while charters are reported of a vessel to load at either New York, Philadelphia or Baltimore with petroleum for Bremen or Havre at 5s. $\frac{1}{2}$ d., or for Antwerp at 5s. 3d.

Grain Movement.

Receipts and shipments of grain of all kinds for the week ending July 8 are reported as follows, in bushels:

	1876.	1875.	Inc. or Dec.	P. c.
Lake ports' receipts.....	2,746,617	2,257,306	489,311	21.7
Lake ports' shipments.....	2,970,194	2,999,833	30,361	1.0
Atlantic ports' receipts.....	3,924,336	2,805,086	1,019,250	36.4

Of the shipments from the Northwest, 40% per cent. was by rail this year, against 26% per cent. in 1875 and 42 per cent. in 1874. The rail shipments are much smaller than for any other week since navigation opened; but the total shipments are also much smaller. Compared with the preceding week, Northwestern shipments have fallen off 635,000 bushels, 580,000 bushels of it being the decrease in rail shipments.

San Francisco shipments for June were 264,167 bushels of wheat and 35,900 barrels of flour. For the California crop year, which ends with June, the shipments were as follows:

	1875-76.	1874-75.	Decrease.
Flour, barrels.....	444,700	467,800	23,100
Wheat, bushels.....	10,146,000	14,622,833	4,476,833

Total, bushels.....12,147,150 16,727,933 4,580,783

For the last four years the shipments have been as follows:

	1875-76.	1874-75.	1873-74.	1872-73.
Flour, barrels.....	444,700	467,800	539,900	265,000
Wheat, bushels.....	10,146,000	14,622,833	12,130,000	16,402,500

Total, bushels.....12,147,150 16,727,933 15,000,550 17,667,500

The shipments of the year just closed were thus the smallest of the four, but the reports of this year's crop (now beginning to be marketed), indicate that it will afford a larger surplus for export than that of any preceding year.

Receipts and shipments at Chicago for the week ending July 15 were:

	1876.	1875.	Inc. or Dec.	P. c.
Receipts.....	1,527,322	1,496,205	Inc. 31,117	2.1
Shipments.....	1,615,422	1,861,310	Dec. 245,888	10.0

Compared with the previous week of this year there is a slight decrease in receipts and a slight increase in shipments. The movement, though not half as great as a few weeks ago, is still a good one for this season.

Coal Movement.

For the week ending July 8 coal tonnages are reported as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Anthracite.....	144,611	413,165	Dec. 268,554	72.0
Semi-bituminous, Broad Top.....	3,655	.....	.....	.....
" " Clarfield.....	10,618	15,726	Dec. 5,108	33.2
" " Cumberland.....	38,463	92,463	Dec. 54,000	38.4
Bituminous, Barclay.....	5,839	6,850	Dec. 1,011	10.4
" " Allegheny Region.....	5,102	23,217	Dec. 18,115	18.3
" " Pittsburgh Region.....	17,950	.....	.....	.....

Anthracite production is partially suspended. Shipments are generally light for the week, owing to the unusually well-kept holiday occurring therein.

During the six months ending July 1 the Pittsburgh Division of the Baltimore & Ohio delivered to the Main Line at Cumberland 86,576 tons of coal.

During June the Columbus & Hocking Valley road carried 48,972 tons (of 2,000 lbs.) of coal, being 4,081 car-loads of 12 tons each.

Iron Movement.

The shipments of iron ore from the Lake Superior Region from the opening of navigation up to July 5 were as follows:

	1876.	1875.	Increase.	P. c.
Marquette, tons.....	139,508	137,583	1,925	1.4
Escanaba.....	116,879	74,167	42,712	57.3
L'Anse.....	18,597	17,582	1,015	5.8
Total.....	274,984	229,332	45,652	19.8

Returns of Railroad Earnings.

The New York Stock Exchange, through its Committee on Statistics, has addressed a circular to all companies whose stocks or bonds are dealt in on the Exchange, requesting them to make monthly returns of gross and net earnings on forms to be supplied by the Committee. These returns are to be filed and preserved for reference.

Railroad Traffic.

For June the Utah Central reports 9,563 tons of freight, of which 2,279 tons were coal and coke.

The Utah Southern reports 9,071 tons of freight moved, 3,562 tons being ore and bullion.

OLD AND NEW ROADS.

The Fast Mail Train.

The New York Central & Hudson River and the Pennsylvania railroad companies have notified the Post Office Department that they will discontinue the running of the fast mail trains after July 22. They state that the pay they have received is entirely inadequate to the service done, but they have continued it in the hope that Congress would provide for their compensation at equitable rates. In view of the fact that the appropriation bills as passed largely reduce the amount to be paid for transportation of the mails, they do not feel justified in continuing the expensive service now given, and the trains will accordingly be withdrawn.

The North Shore Railway Loan.

A London dispatch of July 13 quotes from the London Times of that date as follows: "It is time that something was done, not only if Canadian lines are to stand against foreign competition and cease preying on each other, but to present a united front against ruinous competitive schemes at home. We believe it is intended, within a few days, to try to float in London bonds of the North Shore Railway, which found no market here last year. This time, in order to make them successful, they assume form of a loan guaranteed by Province of Quebec. This is directly opposed to almost all existing railway interests in Canada, but while English shareholders fight each other in Canada with the rival lines they have already built, they can hardly wonder at Canadians thinking it easy to continue the game so long as new schemes can be invented. The policy should be to consolidate existing railway interests in the Dominion and refuse the means to destroy property which already exists, by lending money to promoters of rival undertakings such as the country may not want for a generation, if ever."

The Pacific Railroads and the Government.

A bill has been reported to the Senate by the Judiciary Committee for the purpose of settling the whole case in controversy. By the first section the net earnings, of which 5 per cent. per annum is required by the existing law to be paid to the United States, are defined to be the gross receipts less only the actual operating expenses.

By the second section the Secretary of the Treasury is to retain the whole amount earned by any Pacific railroad for Government transportation, one-half to be immediately applied to the liquidation of interest advanced on subsidy bonds and the other half to make part of a sinking fund.

The third section provides that on Feb. 1 of each year the Union and Central Pacific railroad companies shall pay into the Treasury to the credit of said sinking fund \$1,500,000 each, or so much thereof as shall be necessary to make the 5 per cent. payment and the Government transportation account (together with this sum) amount in the aggregate to 25 per cent. of the whole net earnings of each company for the year ended with the previous December. The net earnings are to be computed as above defined, and no provision is made for reinvesting or compounding the interest or the sums thus paid, but it is simply required that they shall be invested in United States bonds. The same requirements are made in regard to the Kansas Pacific, Sioux City & Pacific, and the Central Branch, Union Pacific, except that the amounts of their annual payments are estimated at \$850,000, \$100,000 and \$75,000 respectively.

The fourth section provides that whenever it is satisfactorily shown to the Secretary of the Treasury, by any of said companies, that 75 per cent. of its net earnings for any current year are or were insufficient to pay interest for said year upon obligations paramount to those of the United States, and that interest has been paid out of such net earnings, he shall remit so much of the 25 per cent. as was thus applied. The sixth section prohibits the payment of any dividend by any of the companies at any time when it is in default of any amount required to be paid to the United States. Officers violating this section shall be liable to \$10,000 fine and one year's imprisonment. It is next provided that the bonds shall be paid out of the sinking fund as they mature, and that said sinking fund shall be held also as security for all prior mortgages, and creditors paramount to the United States by the companies shall not be released from the duty of providing for such claims from other funds. By the ninth section the United States claim is made to cover all property granted to or acquired by the companies.

The remaining sections make it the duty of the Attorney General to prosecute for the benefit of the United States all violations of this act; provide that a failure for six months to comply with its requirements shall operate as a forfeiture of charter; declare that this act shall be held as an amendment of the acts of 1862 and 1864, and, finally, reserve the rights to alter or amend them further or to repeal them altogether.

New York Central & Hudson River.

The Buffalo Commercial says: "We understand that by a new arrangement the extensive repair and car shops of the Central Railroad Company, at Rochester and Niagara Falls, are soon to be removed to Buffalo, and that all work on the division between here and Syracuse will hereafter be done at the general shops in this city. For this purpose extensive new buildings are to be erected at East Buffalo, for which Mr. Joseph Churchyard has already received the contract."

Waterville & Washington.

Contracts have been let for the work on this road, which is to extend from Waterville, Kan., the terminus of the Central Branch, Union Pacific, west by north to Washington, about 20 miles.

Southern Maryland.

It is said that work is to be resumed on this road, and that a contract has been let under which the whole road from Washington to Point Lookout is to be completed this year. A good deal of grading was done upon it four years ago, but work has been suspended since 1873.

Chicago & Tomah.

A section of 14 miles of this road has been completed and will soon be opened for traffic. It extends from Spring Green, Wis., on the Prairie du Chien Division of the Chicago, Milwaukee & St. Paul, to Richland Centre. It is of 3 ft. gauge and is laid with wooden rails.

Valley of Virginia.

Under the temporary lease to the Shenandoah Valley Company the running of trains was resumed last week. A meeting of the Shenandoah Valley company was to be held in Winchester, Va., July 19, to vote on the question of confirming the lease. No satisfactory arrangement for the exchange of business with the Valley Branch of the Baltimore & Ohio at Harrisburg has yet been made, although negotiations are in progress.

Cornwall Canal Enlargement.

Sealed tenders for the formation of a new entrance to the Cornwall Canal, on the St. Lawrence River in the Province of Ontario, will be received by Mr. F. Braun, Secretary of the Board of Public Works in the Dominion of Canada, at his office in Ottawa, Canada, until Aug. 2. The works will include two lift-locks, waste-weir, etc. Plans and specifications can be seen at the office in Ottawa and the Canal Superintendent's office, Cornwall, after July 28. Bids must be made on the printed forms provided, must be accompanied by a certified check for \$4,000, and good security will be required from the contractor.

Ghesapeake & Ohio Canal.

A new outlet from this canal to the Potomac River at Georgetown, D. C., has been completed. The elevation to be overcome is about 40 feet, and in order to avoid the use of several locks an inclined plane has been constructed upon which runs a large caisson filled with water into which the boat is floated. The caisson, which, with water and boat, weighs 350 tons, is supported on trucks and is raised and lowered by water power. The outlet has been built under the supervision of Mr. W. R. Hutton, engineer.

Delaware & Bound Brook.

In the New Jersey Court of Errors last week arguments were heard on the appeal from the decision of the Chancellor refusing to grant an injunction against the construction and maintenance of the bridge over the Delaware at Yardleyville. The Court postponed its decision until the next term.

Nashua & Rochester.

In Portsmouth, N. H., July 17, before Judge Stanley, as referee, the hearing was begun on the claim of Hitchings & Lynch, contractors, for some \$73,000 for extra work done on this road. This extra work was chiefly in the substitution of solid embankment for trestle and pile bridges at several points. The hearing was finally adjourned until Aug. 22, at Nashua.

Hudson Tunnel Railroad.

The New Jersey Court of Errors has decided to dissolve the injunction against this company, so far as relates to lands held by the Delaware, Lackawanna & Western Company and the New Jersey Shore Improvement Company. As to the land held by the State the injunction is continued until a further hearing. This, however, will not prevent the company from going on with its work.

Dividends.

Dividends have been declared by the following companies: Delaware & Hudson Canal, 4 per cent., semi-annual, payable Aug. 1. This is a reduction of 1 per cent. from the usual dividend.

Delaware, Lackawanna & Western, 2½ per cent., quarterly, payable July 20.

A Boston Rapid Transit Project.

It is proposed to build a narrow-gauge road to start from a depot to be placed in Washington or Tremont street in Boston, to pass under Beacon Hill and the Charles River by a tunnel and come to the surface in Cambridge. It is proposed to continue this line out into Middlesex County, and also to connect

it with the Boston, Revere Beach & Lynn, the projected Boston & Newton, the Boston, Lawrence & Haverhill and other roads, making it a sort of general narrow-gauge entrance into the city.

Washington City, Virginia Midland & Great Southern.

In the suit of Graham and others, begun last month in the Virginia State Court, at Alexandria, Judge Keith has appointed Mr. John S. Barbour, Receiver. Mr. Barbour is President of the company.

Western Union Telegraph.

In the suit to enjoin this company from paying the dividend lately declared, the New York Supreme Court, July 14, made an order permitting the company to pay the dividend upon giving bonds to secure the plaintiff in the suit from any damage which he might receive from such payment.

Scioto Valley.

The survey of the extension from Chillicothe, O., to Portsmouth is nearly completed. The engineers are also running a line for a branch from Circleville southeast to some coal mines a few miles distant.

Chicago, Danville & Vincennes.

The Illinois Circuit Court has refused to grant an injunction against the payment of interest on certain bonds issued by Grant township, Ill., in aid of this road. The court holds that the case is covered by the Supreme Court decision in a similar case recently holding such bonds valid although they were not issued until after the adoption of the present constitution of Illinois.

Lafayette, Muncie & Bloomington.

The court has finally approved of the compromise as to the entrance into Lafayette, Ind., and decides that this company must pay the Indianapolis, Cincinnati & Lafayette \$15,000 for the right of way and land taken from that company.

The Hoosac Tunnel Line.

The tunnel being now substantially completed, the running of regular express trains between Boston and Albany by this line was begun July 17. The Fitchburg Railroad Company runs its engines through the tunnel and will establish its yard and engine-house at North Adams.

Hempstead & Sabine.

This road is now graded and the ties laid from Hempstead, Tex., to Mink's Prairie. It is to be on the prismatic or one-rail plan.

Portsmouth, Great Falls & Conway.

Under the head of "Eastern" last week (page 314) we reported that the Portsmouth, Great Falls & Conway stockholders met July 11 and rescinded a resolution for a union with the Eastern Company passed some time since. This action was not taken by the Portsmouth, Great Falls & Conway stockholders, but by those of the Eastern of New Hampshire, which leases the Portsmouth, Great Falls & Conway, and has sublet it with its own road to the Eastern of Massachusetts. The latter owns a majority of the stock of the Portsmouth Company, and so will be able to control its action.

Atlantic & Pacific.

A small meeting of bondholders was held in New York, July 14, to receive and consider the report of the Committee on Reorganization. It was decided to foreclose and reorganize the Missouri Division of the Atlantic & Pacific Railroad Company, and Andrew Peirce, Joseph Seligman, James D. Fish, William H. Coffin and J. P. Robinson were appointed a committee to buy in the road for the benefit of the bondholders and to organize the new corporation. The scheme provides for a reinstatement of the stock and bonds upon the payment of an assessment of 25 cents per share upon the old common stock, \$1 per share upon the old preferred stock, which will be converted into second preferred, and \$5 per share upon the unsecured bonds, etc., which are to be converted into a first preferred stock. The new bonds are to be issued with the interest as follows: 2 per cent. for two years, 3 per cent. for two years, 4 per cent. for one year, 5 per cent. for one year, and 6 per cent. thereafter.

Erie.

A telegram from London, dated July 13, says: "At a meeting of the Erie Railway bond and stockholders at the Cannon Street Hotel to-day, Mr. Jewett, Receiver of the road, made a statement of its condition. He said that the plan of reorganization submitted by Sir Edward Watkin at the meeting of the stockholders on June 23 was approved; but he asked that one more coupon be funded, and a few other concessions. He proposed to lay a third rail from New York to Buffalo, to gradually wear out the old equipment, and to replace it with a narrow-gauge equipment. He felt sanguine of the prosperity of the road. Many speeches followed. Mr. Jewett's statement was well received. Sir Edward Watkin offered a resolution assuring Mr. Jewett support, and approving the scheme with the modifications desired by the Committee. Sir Edward Watkin's plan above mentioned is as follows: 'That without reducing the rate of interest, beginning next September, they should fund for a period of four and a half years the alternate coupons of the first bonds, paying alternate coupons in gold, and that they should fund of the second bonds nine half-yearly coupons in a lump.'

Detroit & Milwaukee.

Receiver Trowbridge reports for June as follows:

Cash on hand June 1.....	\$44,052 71
Freight account.....	\$40,019 67
Passage ".....	29,723 52
Other ".....	9,420 05
Total.....	79,185 95

Disbursements.....\$123,215 95
The disbursements were \$3,492.71 in excess of the receipts.

Manchester & Keene.

Work has been begun on the western end of this line at Keene, N. H. The contractors expect soon to have 500 men at work and to finish the road about Jan. 1, 1877.

California Pacific.

In San Francisco recently an effort was made to set aside the judgment of the District Court in favor of the validity of the Central Pacific endorsement of the bonds. The Court declined to take action, on the ground that the case had been made up with the special object of securing a review by the Supreme Court, and all questions at issue could safely be left to that Court.

Little Rock, Mississippi River & Texas.

As soon as the location of the new line to the Mississippi River at Chicot, Ark., is finished, the engineers will be put upon the extension of the Red River Line from its present terminus at Bayou Bartholomew west to Camden. It is proposed to build this section as soon as possible.

Pacific, of Missouri.

The New York Tribune says: "Commodore Garrison is the principal bondholder of the Missouri Pacific Railroad and the most active person in the reorganization. His plan is as follows: If he is the purchaser of the railroad at the foreclosure sale, he will organize a new railroad company, which will make a purchase money mortgage, subject to the existing mort-

gages, for the sum of \$5,000,000 in bonds of \$1,000 each, bearing 7 per cent. interest, the principal to mature in 30 years from date. Of this \$5,000,000, \$700,000 is to be reserved for the payment of debt to the county of St. Louis, and the balance will be used for third-mortgage bondholders, and for the purchase of new equipment and for other purposes. The third-mortgage bondholders who join in the scheme by depositing their bonds before the 1st day of September, 1876, are to receive in place of their old bonds a like amount, exclusive of interest, of the new issue of \$5,000,000."

Toledo, Wabash & Western.

The stockholders' committee has made another appeal to stockholders to come forward and pay up the assessments upon their stock, so as to enable the committee to prosecute the suit to set aside the foreclosure and sale of the road. The circular contains nothing new, merely recapitulating the action already taken and recounting the grounds upon which it is thought that the foreclosure can be invalidated. Holders are asked to have stock transferred to their own names and to pay the assessments (25 cents per share) without delay.

Missouri, Kansas & Texas.

A correspondent of the St. Louis Republican writes as follows of the damage done by the recent storms in the Indian Territory: "The track of that road, which has suffered great damage from the freshets, are now repaired, and trains pass through this side of Red River without transferring passengers and freight."

"The worst damage done to the track was between the Verdigris River and Gibson station, where a transfer had to be made for some days, a distance of two miles. The track has been temporarily repaired by cobbling up the ties."

"The bridge across the Arkansas River was preserved intact, although the water was so high that the drift wood struck the telegraph wires."

"The bridge across the Verdigris was saved by being anchored in time so as to resist the force of the furious current."

"One span of the Red River Bridge gave way, and striking against the wagon bridge, below, which cost \$25,000, the latter was entirely swept away. Passengers had to be transferred across the river in skiffs. There was a transfer made at one time of 128 passengers, who were taken across in one little skiff, four at a time. They are putting across a temporary bridge which is being done by the American Bridge Company, the original builders, who guaranteed the safety of the bridge for a certain number of years."

"The damages caused by the recent rains to the Missouri, Kansas & Texas road will amount, it is stated, to over \$150,000."

Gulf, Colorado & Santa Fe.

Track is now laid on the third section of five miles westward from Galveston, Tex. Application has been made for a corresponding issue of the Galveston county bonds. Iron for 10 miles more has been purchased and shipped from New York.

Houston & Texas Central.

The change of gauge from 5 ft. 6 in. to 4 ft. 8 1/2 in. on the section of 120 miles from Hearne, Tex., to Houston is to be made July 22. The shops of the road have been busily engaged in the necessary preparations.

Texas & Pacific.

On the extension of the main line from Eagle Ford, Tex., west to Fort Worth, iron is laid to Hayter, 12 miles from Eagle Ford, leaving 14 miles to be put down to reach Fort Worth. Work on this is progressing steadily.

On the Trans-continental Division, 73 car-loads of iron have been received at Sherman and forwarded east and tracklaying is in progress there also.

Delaware Shore.

The track is now laid from the junction with the West Jersey road near Woodbury, N. J., south-west to Pennsgrove, 20 miles. The track is being put in order and regular trains will soon be put on. The road is parallel and near to the Delaware River for most of the way and is expected to open up a new country to suburban settlement and to do a considerable business in garden products for the Philadelphia market. It is stated that the road has been built for about \$300,000, or \$15,000 per mile, of which \$100,000 was raised by stock subscriptions and \$200,000 by the sale of bonds. Most of the grading was light.

East Line & Red River.

Work on this road is now fairly in progress, and it is hoped that cars will be running for at least 25 miles from the eastern terminus at Jefferson, Tex., this year. A construction company has been formed to aid the building of the road through Hopkins County.

Tyler Tap.

About one-half of this road from Tyler, Tex., through Gilmer and Pittsburgh to Mount Pleasant is now graded, and contracts for ties and bridges are being let. The iron for 20 miles has been bought, and negotiations for 30 miles more are in progress. The grading is almost all light.

Galveston, Houston & Henderson.

Everything is now in readiness for the change of gauge from 5 ft. 6 in. to 4 ft. 8 1/2 in. The change will be made July 22, that of the Houston & Texas Central taking place on the same day.

Houston & East Texas.

At Houston, Texas, July 4, a formal beginning of work on this road was made. It is to run from Houston eastward, is to be a narrow-gauge road, and is controlled by the same parties as the Texas Western. It is proposed to build 25 miles this season.

Cincinnati & Martinsville.

The bondholders who bought this road at foreclosure sale have resolved not to operate it at present, as it is understood that it does not pay expenses and they are unwilling to advance any more money. The road will accordingly be closed and trains withdrawn for the present. It is 39 miles long, from Martinsville, Ind., to Fairland, and has recently been worked by the Indianapolis, Cincinnati & Lafayette under a temporary agreement.

Alabama & Chattanooga.

After hearing argument in the matter the United States Circuit Court at Mobile has made a decree extending to Sept. 1 the time for the bondholders to complete their purchase of the road and to pay the \$210,000 still due on account of that purchase. In case they do not comply with the decree by Sept. 1, the special commissioners are directed to advertise the road for sale and to sell it again in Mobile, Oct. 4, upon substantially the same terms as those set forth in the decree of Aug. 29, 1874, under which the original sale of the road was had.

St. Paul & Pacific.

The Amsterdam Committee on the 2d of July issued a report in which they say that President Barnes obtained possession of the company's property without difficulty, and had made reductions in expenses which will amount to about \$60,000 a year; that 500 to 1,000 tons of steel rails will be needed during the year to renew the track between St. Paul and Minneapolis; that the President judges it necessary to lay a track from the western terminus of the Main Line at Breckenridge northward to the junction of the Northern Pacific with the St. Vincent Extension at Glyndon (40 miles); that he has suspended obnoxious freight and road contracts, and hopes to modify the

very onerous elevator contracts in favor of the company; that the contracts with the Chicago, Milwaukee & St. Paul and the Chicago & Northwestern will be revised; that the earnings are increasing, 5,000 families having settled along the line last spring. Within eighteen months \$1,812,690.98 of bonds and coupons were canceled by being accepted in payment for lands. The difficulties between First Division St. Paul & Pacific Railroad Company, the St. Vincent and Brainerd extensions and the Northern Pacific will probably be settled this year. The amounts of bonds outstanding are reported as follows:

Branch Line.....\$1,077,500
Main Line.....1,377,500
1869 bonds.....5,445,000

Purchases were made continually on the Amsterdam Exchange for account of New York bankers and two St. Paul men who speculate largely. The earnings for the ten months from July to April, inclusive, were:

1875-76. 1874-75. Increase. P. c.
Branch Line (76 miles).....\$271,980 37 \$258,569 67 \$13,411 28 5.2
Main Line (210 miles).....496,020 37 860,626 03 364,605 84 34.8

Total (\$76 miles).....\$768,001 32 \$619,195 70 \$148,805 62 22.4

During April last the Land Department sold 240 acres of Branch Line lands, 200 at \$5 and 40 at \$4 an acre, while it in the same month sold 12,628 1/2 acres of Main Line lands, at an average price of \$6.41 an acre.

Ohio & Mississippi.

The Union Trust Company of New York, trustee, gives notice that, according to the terms of the mortgage, 40 of the consolidated first-mortgage bonds of this company have been drawn for redemption. They must be presented for payment at the office of the trustee, No. 73 Broadway, New York, within six months from July 10. The numbers of the bonds drawn are:

3109, 3165, 3275, 3360, 3395, 3503, 3506, 3552, 3821, 3835, 3868, 3993, 4099, 4064, 4133, 4350, 4354, 4442, 4676, 4979, 4994, 5017, 5037, 5052, 5091, 5125, 5161, 5289, 5602, 5626, 5820, 5966, 5990, 6018, 6054, 6181, 6262, 6324, 6405, 6618.

The Illinois Tax Cases.

Springfield (Ill.) dates of July 11 say: "The injunctions heretofore issued against the collection of the capital stock of the following railroad corporations were to-day dissolved on motion of the Attorney-General: Chicago, Pekin & Southwestern, Chicago & Paducah, Iron Mountain, Chester & Eastern, Springfield & Southeastern, Cairo & Vincennes, Paris & Danville. In the cases of the St. Louis & Carondelet Railroad Company, and Illinois & St. Louis Railroad Company, the injunctions were set aside as to the tax against the defendants as railroad corporations, but remain in force in other respects. To-morrow argument will be made by Hon. Richard Thompson and Col. Bob Ingersoll and Hon. M. Hay, as to like cases against other railroad corporations."

Anderson, Lebanon & St. Louis.

President Zion reports the cost of the 20 miles from Anderson, Ind., to Noblesville at \$201,468, of which \$23,000 was for right of way, \$97,500 for rails and fastenings, \$17,593 for laying the track and the balance for grading, bridging and ties. About eight miles are still to be ballasted, which will make the cost of the road about \$213,000 or \$10,650 per mile.

Little Rock & Fort Smith.

The track is laid to the terminus at Cherokee, Ark., on the Arkansas River opposite Fort Smith, completing the road. Cherokee is about 160 miles westward from Little Rock and is 35 miles beyond the late terminus at Ozark. Trains were to begin running through this week.

Southern Pacific.

A San Francisco dispatch of July 13 says: "Dispatches from Los Angeles state that only 114 feet of heading remains to be taken out of the great San Fernando Tunnel on the Southern Pacific Railroad, and that in a few days the rails will be laid through it. The track-layers having crossed the Sierra Nevada Mountains at Tehachas are moving down Cimeron Creek to the Palm Plains, and will soon be ready to effect a junction with the southern division at or near San Fernando Tunnel."

New Jersey Midland.

The bondholders' committee has taken an appeal from the order of the Chancellor of New Jersey directing the Receivers to pay some \$22,000, money advanced to the company by the directors before the Receivers were appointed.

St. Louis, Bloomfield & Louisville.

The track of this new road has been extended from Bloomfield, Ind., southeast to Bedford, 29 miles, making the whole length of the road 35 miles, from the Indianapolis & Vincennes crossing at Switz City to the Louisville, New Albany & Chicago at Bedford. It is a narrow-gauge road.

Seattle & Walla Walla.

The contract for the piling and bridging of this road from a point six miles south of Seattle, Wash. Ter., to Black River, has been let to Easton & Webster. There is much swampy land and many small streams on the line.

The Grand Trunk and the Great Western.

The Toronto (Ont.) Monetary Times of July 15 says: "The Grand Trunk and Great Western railways at length tired of competition have tried negotiation. Although nothing practical has resulted from the correspondence which passed between the boards of the two rival companies, we are glad to see an attempt made to arrange more economical working. The good feeling which exists may lead to a settlement of the differences respecting rates from points where the lines come into competition."

"The proposal which the Grand Trunk made to the Great Western was an amalgamation of the two roads, or a fusion of net receipts to the west of Toronto. The Great Western board submitted a scheme which was rejected on the ground that it was out of the question. The arrangement was that the Grand Trunk should lease to the Western in perpetuity, or for a long period, all the lines to the west of this city, at a rising rent, together with a fair share of the rolling stock. The lease was to include the Detroit & Sarnia and the Buffalo & Lake Huron branches, an interest in the International Bridge, and a part of the Toronto station. Assuming that the whole 1,388 miles of the Grand Trunk yielded an income of \$2,000,000 a year, it was estimated the 423 miles of line which the terms of the lease would include, would return an annual revenue of \$750,000. The rent offered by the Great Western was \$225,000 annually. And this was to be increased by \$10,000 a year for every half per cent. the Great Western paid annually on its ordinary stock up to 1 1/2 per cent. For every half per cent. above 1 1/2 per cent. a year, which the company could pay on the stock, the increase in the rental was to amount to \$20,000."

"The rent proposed was regarded as entirely too small by the directors of the Grand Trunk. Besides, they properly urged that as the net receipts of the Great Western did not cover their own mortgages by \$100,000, there would be no security for the payment of even the smallest portion of it. They also thought the scheme was one of dismemberment, and calculated not only to interfere with the interests of this country, but would be to give away at once all the Grand Trunk had ever endeavored to accomplish."

"While the negotiations were going on some doubt arose as to the legality of either arrangement without special legislation under the existing laws of the Dominion. Legal opinion was taken, and the conclusion arrived at was that the union could not be carried out. Probably it is well for Canadian shippers

it could not. If the lines would yield any profit by working together, we are of opinion they would be scarcely less profitable by working separately. By abandoning competition the affairs of both roads would certainly be improved. And without reflecting on the right which the English bondholders, of both lines, have to control their property as they choose, we think the plan of the management, practically, in this country, would result beneficially to themselves."

Louisville, Paducah & Southwestern.

Under the decrees of foreclosure granted by the United States Circuit Court, Mr. E. H. Murray, Commissioner, will sell this road at public sale in Louisville, Ky., July 27. The Main Line, from Elizabethtown, Ky., to Paducah, will first be offered for sale separately, then the Louisville Extension, and lastly the road will be offered as a whole. The sale will include all the equipment, shop tools and supplies on hand. The terms of sale are \$15,000 cash on each division, or \$30,000 for the whole road; balance to be payable when the sale shall be confirmed by the Court. The depot property in Louisville will be sold separately under the mortgages thereon, given to secure the purchase money.

Poughkeepsie Bridge.

The amount of subscriptions necessary to secure the closing of the contract with the American Bridge Company, of Chicago, has been so nearly obtained that the directors of the Poughkeepsie Bridge Company have agreed to give their personal guarantee for the small amount lacking. The American Bridge Company will at once make arrangements to begin the work.

Kingston.

A preliminary survey has been made for a branch road about three miles long from Kingston Village, R. I., to Kingston depot on the New York, Providence & Boston road. It is also proposed to extend it from Kingston Village to tidewater, about three miles in the opposite direction.

California Pacific.

On the Tehama Branch the track is laid to Williams, Cal., 38 miles northward from the junction with the main line at Woodland. Trains were put upon the road last week and now run regularly to Williams, which is the station for the town of Colusa.

Portland & Ogdensburg—Vermont Division.

It is now proposed to execute a new preferred mortgage upon this road for the purpose of raising money to complete it. The three companies owning the line, the Lamotte Valley, the Essex County and the Montpelier & St. Johnsbury, have given the necessary authority to make such a joint mortgage. It cannot be done, however, without the consent of the present first-mortgage bondholders.

ANNUAL REPORTS.

Cincinnati, Hamilton & Dayton.

The annual report of this company covers the year ending March 31, 1876. During that year, as in the preceding one, the company worked the following lines:

Miles.
Cincinnati, Hamilton & Dayton, owned, Cincinnati, O., to Dayton, 80
Dayton & Michigan, leased, Dayton, O., to Toledo, 142
Cincinnati, Richmond & Chicago, leased, Hamilton, O., to Richmond, Ind., 46
Cincinnati, Hamilton & Indianapolis, leased, Hamilton, O., to Richmond, Ind., 98

Total.....346

The whole system forms a line 302 miles long from Cincinnati to Toledo, with branches to Richmond and Indianapolis. The Cincinnati, Hamilton & Indianapolis, nominally a separate organization, is practically owned by the lessee.

The equipment of the whole system consists of 85 engines; 56 passenger, 1 reclining chair car, 3 mail and 23 baggage cars; 195 stock, 933 box, 211 coal, 344 flat and 30 caboose cars; six work-train, 74 hand and 75 truck cars. The company has also 50 box and 50 flat cars in the Saginaw & Cincinnati Lumber Transportation Line.

The capital account at the close of the last two fiscal years was as follows:

1876. 1875. Inc. or Dec.
Capital stock.....\$3,500,000 00 \$3,500,000 00
Bonded debt.....2,350,000 00 2,350,000 00 Inc. \$700,000 00
Bills payable.....75,076 14 635,715 82 Dec. 560,639 68
Surplus earnings.....1,432,328 62 1,244,337 80 Inc. 187,990 82
Current accounts.....387,071 13 418,300 71 Dec. 31,229 58

Total.....\$8,344,475 85 \$8,048,354 33 Inc. \$296,121 52

The stock is \$58,333 and the bonds \$49,167 per mile owned. The assets include advances of \$1,403,570.37 to the Cincinnati, Hamilton & Indianapolis; \$530,358.65 to other leased lines, and \$87,559.57 to the Cincinnati, Richmond and Fort Wayne road.

During the year a consolidated mortgage for \$3,000,000 has been executed, the proceeds of the bonds to be used in retiring those of previous issues and in funding the floating debt. Of these bonds \$1,000,000 have been placed in New York at a price which nets the company 87 1/2, and \$700,000 of these have been sold and the proceeds received.

The capital accounts of the leased lines are as follows:

Dayton & Michigan. Cin., Rich. & Chi.
Common stock.....\$2,401,567 83 \$382,500 00
Preferred stock.....1,250,000 00
Bonded debt.....2,735,800 00 625,000 00
Other accounts.....684,833 63 14,568 40

Total.....\$7,105,401 36 \$1,022,168 40

No statement of work done is made, except that there was an increase of 13.7 per cent. in passenger-train mileage and of 9.8 per cent. in passengers carried; an increase of 8 per cent. in tonnage and of 11.7 per cent. in freight-train mileage. The average receipt per passenger-train mile was 85 cents; per passenger per mile, 2.558 cents. The receipts per freight-train mile were \$1,469; per ton per mile, 1.691 cents. There was an increase in both through and local passenger traffic; a decrease in local and an increase in through freight.

The earnings of the whole system were as follows:

1875-76. 1874-75. Inc. or Dec. P. c.
Passengers.....\$870,745 98 \$834,425 89 Inc. \$36,321 09 4.4
Freight.....1,587,890 34 1,589,090 39 Dec. 200 05
Rents of road.....233,316 77 190,000 00 Inc. 42,716 77 22.4
Mails, express, etc.....183,825 29 204,909 45 Dec. 21,174 16 10.3

Total earnings.....\$2,875,778 38 \$2,818,425 73 Inc. \$57,352 65 2.0

Transportation expenses.....1,905,943 50 1,773,763 78 Inc. 132,179 72 7.5
Taxes.....116,486 52 112,171 55 Inc. 4,314 97 3.8

Total ex'p's.....\$2,022,430 02 \$1,885,935 33 Inc. \$136,504 69 7.2

Net earnings.....\$853,348 36 \$932,490 40 Dec. \$79,141 04 8.5

Gross earnings per mile.....\$8.36 \$8.169 Inc. \$0.191 2.0

Net earnings per mile.....2.473 2.702 Dec. 229 8.5

Per cent. trans. expenses.....66.28 62.94 Inc. 3.34 5.3

Per cent. exp's and taxes.....70.33 67.92 Inc. 2.41 5.1

The earnings and expenses were distributed as follows:

	Earnings.	Expenses and taxes.	Net earnings.	Earn. P. c. of mile.
Cin., Ham. & Dayton.....	\$1,147,753 24	\$730,021 21	\$417,732 03	\$19,129 63.66
Dayton & Michigan.....	1,079,394 91	699,794 17	379,599 74	7,601 64.83
Cin., Richmond & Chicago.....	221,116 86	169,086 61	52,029 95	4,914 76.45
Cin., Ham. & Ind.....	427,524 87	422,978 03	4,546 84	4,363 98.94
Totals.....	\$2,875,779 38	\$2,022,430 02	\$853,349 36	\$3,336 70.33

The disposition of net earnings and the general income account were as follows:

	Net earnings.	Interest and guaranteed dividend.	Surplus.	Deficit.
Cin., Ham. & Dayton.....	\$417,732 03	\$162,430 00	\$255,302 03	.....
Dayton & Michigan.....	379,599 74	926,332 88	63,357 86	.....
Cin., Richmond & Chicago.....	52,029 95	49,850 16	6,229 79	.....
Cin., Ham. & Ind.....	4,546 84	183,290 87	.....	\$178,744 23
Totals.....	\$853,349 36	\$718,803 91	\$134,545 45	\$178,744 23
Net surplus.....			\$137,545 45	
New consolidated bonds sold (\$700,000 par value).....			612,500 00	
Decrease of material on hand.....			21,624 31	
Equipment sold.....			7,900 00	
Total.....				\$779,469 76
C., H. & D., improvements and equipment.....			\$30,577 90	
Internal revenue taxes.....			5,618 13	
Increase of bills receivable.....			11,525 81	
Decrease of current liabilities.....			1,046 64	
Decrease of bills payable.....			560,689 68	
Sundry accounts.....			10,953 76	
Cin., Richmond & Fort Wayne guarantee.....			33,041 80	
D. & M., sinking fund.....			30,000 00	
Construction and equipment.....			18,160 00	
C., H. & I., equipment, renewals and improvements.....			87,906 14	
Total.....				\$779,469 76

The amount added to credit of surplus earnings was \$275,490.82. No dividends were paid except those guaranteed on the stock of the Dayton & Michigan.

On the Cincinnati, Hamilton & Dayton there were used in renewals 1,052 tons steel and 95 tons iron rails and 30,307 new ties. There are now 40 1/2 miles of steel in the track. A heavy switching engine was bought and one broken up. Several new water tanks and station buildings were put up and extensive repairs made to bridges and buildings. On the Dayton & Michigan 2,013 tons iron and 61,970 new ties were used in repairs; a new engine house and several other buildings were put up and a number of sidings laid. The Cincinnati, Richmond & Chicago has had one new engine and some improvements to bridges, etc.; 318 tons iron and 6,868 new ties were used in renewals. The Cincinnati, Hamilton & Indianapolis has had a new engine, new coal yard in Indianapolis, and much work has been done in improvement of bridges and buildings, widening and ditching cuts and protecting fills; 2,706 tons iron rails and 31,280 ties were used in renewals.

There are needed this year some new passenger cars, and some improvements must be made at Brighton and at the Miami River bridge near Hamilton.

The former contract with the Erie and the Atlantic & Great Western for the use by these roads of the track between Cincinnati and Dayton has been terminated by the action of the Receiver of the Erie. A new contract has been arranged, of which the report speaks as follows: "The present contract gives us a pro rata portion of 80 miles in the distance from and to all stations between Cincinnati and Dayton, to and from all stations east of Salamanca, which, by consent of the parties, take New York rates and divisions, and the same distance is allowed us in the division of rates from and to all our stations, to and from interior points in Pennsylvania, or other common points in the East. This is designated as through business, and for all other business we get substantially our local rates; the Erie, and Atlantic & Great Western Railroad furnishing all the cars, for which we pay no mileage."

"Before this contract was finally agreed upon, it had become apparent that the time was near at hand when the broad gauge track could not be maintained without a loss to this company, and arrangements were commenced, several months ago, looking toward its final abandonment, and transferring the business of the broad-gauge road to our narrow-gauge track, by means of the steam hoist, which has been erected by the Atlantic & Great Western Company at Dayton, changing the car-bodies from broad to narrow-gauge trucks. One month's operations under this contract convinced us that no time should be lost in giving the requisite notice of 90 days, as provided, which was done on the 11th of April. Our total receipts from this business, for the year ending March 31, 1875, were \$125,922.17, as against \$253,139.05, the past year, and as the broad-gauge wheelage the past year was greater, the whole difference, \$72,783.12, must be treated as a loss to us of so much net earnings. It is believed that with the abandonment of the broad-gauge track, and using the iron, of which there will be about 8,000 tons, to extend our second track to Hamilton, and furnishing the balance of our road with steel rails, it can be worked with much more economy, and that which is now a loss of net earnings, will in the end be recovered; but it will not restore to us the amount of our investment, except so far as the present value of the rails to the company."

Train Accidents in June.

Very early on the morning of the 1st a train on the Toledo, Peoria & Warsaw road was thrown from the track by a misplaced switch in Warsaw, Ill., and the engine pitched down a bank into the river. The baggage car also left the track and the mail agent was slightly hurt.

On the 1st, in Indianapolis, Ind., there was a butting collision between an Indianapolis, Bloomington & Western shifting engine and an Indianapolis, Cincinnati & Lafayette passenger train, by which both engines were damaged.

On the 1st a south-bound freight train on the Rensselaer & Saratoga road was thrown from the track near Mechanicsville, N. Y., wrecking several cars and blocking the track five hours.

On the afternoon of the 1st a freight train on the Boston & Lowell road was thrown from the track near Winter Hill, Mass., and 10 cars were piled up and badly broken.

On the 2d, as a train on the Toledo, Peoria & Warsaw road was sending some cars upon a siding at Warsaw, Ill., by a flying switch, the brakeman failed to stop them in time and they ran off the end of a siding and into the shops, doing some damage.

On the evening of the 2d, as a freight train on the Detroit, Lansing & Lake Michigan road was running backwards near Belding, Mich., it struck a cow and several cars were thrown from the track, damaging a bridge near by and injuring the conductor.

On the evening of the 2d a construction train on the Lafayette, Muncie & Bloomington road struck a cow near Circleville, Ind., throwing several cars from the track, killing one man and injuring two others.

On the morning of the 5th an engine and two freight cars of a train on the Illinois Central ran off the track in Kankakee,

Ill., and it took six hours to replace them. The accident is said to have been caused by the careless opening of a switch.

On the morning of the 5th a shifting engine on the Rome, Watertown & Ogdensburg road exploded its boiler in Oswego, N. Y., wrecking the engine and throwing pieces of the wreck to a great distance.

On the morning of the 8th a passenger train on the Kansas City, St. Joseph & Council Bluffs road was thrown from the track near Phelps, Mo., and seven passengers were somewhat injured.

On the morning of the 8th a train on the Northern Pacific Road ran upon a bridge over Tamarack River, Minn., which had caught fire during the night and the timbers of which had partly burned through with a slow, smouldering fire. The engine, baggage car and one passenger car went down and were wrecked, killing the engineer and baggage man, injuring the fireman and mail agent badly and 10 passengers less severely. The bridge was a common pile bridge and was approached by a short curve, and had, moreover, burned in such a way that the damage done by the fire could not be seen except upon a close inspection.

On the afternoon of the 9th a train on the Rensselaer & Saratoga road was thrown from the track in Troy, N. Y., by a tie which had fallen upon the track.

On the night of the 9th there was a butting collision between a gravel and an ore train on the New Jersey Midland road by which both engines and several cars were damaged. The gravel train is said to have been running on the ore train's time.

On the 10th a train on the Albany and Susquehanna road ran over a cow near Oneonta, N. Y., throwing five cars from the track and injuring a brakeman.

On the morning of the 11th a freight train on the Texas & Pacific road ran off the track near Jefferson, Tex., wrecking the engine and five cars, injuring the engineer and fireman.

On the morning of the 13th, on the Lake Shore & Michigan Southern road, near Coldwater, Mich., there was a butting collision between two freight trains, by which both engines and five cars were wrecked. It is reported that one of the freights started out without orders.

On the 13th a freight train on the Iowa Midland road was thrown from the track by a misplaced switch in Maquoketa, Ia.

Early on the morning of the 14th the second section of a freight train on the East Pennsylvania Branch of the Philadelphia & Reading road ran into the rear of the first section near Lyons, Pa., wrecking the caboose, killing one man and injuring two others.

On the 15th, as an excursion train on the Missouri Pacific road was going upon a siding at Brownsville, Mo., a truck under the seventh car jumped the track and the car was dragged forward over the truck, breaking up the floor, throwing the passengers in a heap and injuring some 20 of them, several very severely.

On the 15th, a freight train on the Indianapolis, Cincinnati & Lafayette road ran off the track near Zionsville, Ind.

On the morning of the 16th, a construction train on the Boston & New York Air line ran into the rear of a freight train near Rock Falls, Conn., wrecking several cars and injuring a brakeman.

On the 16th, as a train on the Indianapolis & St. Louis road was near Shelbyville, Ill., the brake beam on the forward truck of the baggage car fell upon the track and two cars were thrown from the track and badly broken. The express messenger was killed and a passenger hurt.

On the 16th, a passenger train on the Memphis Line of the Louisville & Nashville road was thrown from the track at Dudley's, Tenn., by a misplaced switch, injuring the engineer and fatally and four passengers less severely.

On the afternoon of the 16th, a passenger train on the Lake Shore & Michigan Southern road ran over a cow near Cleveland, O., throwing the baggage car from the track.

On the morning of the 17th a mixed train on the Delaware Railroad ran over a misplaced switch and into the rear of a passenger train which was standing on a siding at Wyoming, Del. The engine and three cars were badly damaged and five persons hurt, all train-men.

On the 17th, on the Clearfield Branch of the Pennsylvania Railroad, near Osceola, Pa., there was a butting collision between a construction and a local freight train, by which both engines are wrecked and three train-men hurt. A misunderstanding as to time is said to have been the cause.

On the night of the 18th a special train on the Anderson Branch of the Greenville & Columbia road broke through a trestle near Anderson, S. C., and was wrecked. There were five train-men on board, of whom four were killed and one badly hurt.

On the 19th a special train on the Albany & Susquehanna road ran into the rear of a mixed train which was just going into a siding at Howe's Cave, N. Y. An engine and two cars were damaged.

On the afternoon of the 19th, on the Long Island Railroad, at Mineola Junction, N. Y., there was a butting collision between a train on the main line and one on the Locust Valley Branch, by which both engines and a car were damaged. It is said that the brakes on the Locust Valley train gave out.

On the evening of the 19th, as a way freight train on the New York & Oswego Midland road was passing through the tunnel at Shawangunk, N. Y., the derrick on the wrecking car, which was in the train, struck and carried away some of the timbering of the tunnel and a lot of loose rock fell upon the train, wrecking a box car and the caboose badly.

On the afternoon of the 20th the engine and baggage car of a train on the Indianapolis & St. Louis road were thrown from the track near Reno, Ind., by a cow which had strayed upon the track.

On the evening of the 20th the rear car of a passenger train on the Wyandotte, Kansas City & Northwestern road was thrown from the track near Independence, Mo., by the spreading of the rails.

On the morning of the 21st, on the Chicago, Rock Island & Pacific road, near Anita, Ia., there was a butting collision between a passenger and a stock train by which both engines and three stock cars were wrecked and a lot of hogs killed. It is said that the stock was running on the passenger train's time.

On the afternoon of the 21st a train on the Kentucky Central road ran into a drove of cattle near Cynthiana, Ky., throwing part of the train from the track, killing two express messengers and injuring the baggage-master.

Early on the morning of the 22d, a local freight train on the Indianapolis & St. Louis road was thrown from the track by a misplaced switch in East St. Louis, Ill., and the engine and three cars went into the ditch.

Early on the morning of the 22d a passenger train on the Kansas City, St. Joseph & Council Bluffs road struck a broken rail near Kansas City, Mo., and the sleeping car was thrown from the track.

On the morning of the 22d there was a collision between two freight trains on the Illinois Midland road, near Paris, Ill., by which much damage was done and the track blocked nine hours.

Near noon on the 22d an express train on the Eastern Railroad was near Wells, Me., a truck axle broke under the engine, throwing the engine, tender and baggage car from the track, blocking the road three hours and slightly injuring the baggage-master.

On the 22d three cars of a freight train on the Pennsylvania Railroad were thrown from the track at Darnick Point, near Johnstown, Pa., blocking one track five hours.

On the afternoon of the 23d a freight train on the St. Paul & Pacific road was thrown from the track near Minnetonka,

Minn., by the spreading of the rails, said to be caused by the extreme heat.

On the evening of the 23d a Centennial train on the Richmond Branch of the Philadelphia & Reading road was thrown from the tracks in Philadelphia by a misplaced switch. The engine went into the ditch and upset, the cars were somewhat damaged and the engineer and fireman slightly hurt.

On the night of the 23d a construction train on the Memphis & Little Rock road ran off the track near Blackfish, Ark., blocking the track for several hours.

On the 24th a train on the Chicago & Pacific road ran over a calf near Hampshire, Ill., and the engine and two cars went into the ditch, injuring a brakeman badly.

Near midnight on the 25th there was a butting collision between two freight trains on the Ohio & Mississippi road, near Flora, Ill. Both engines and several cars were wrecked, a man, who was stealing a ride, was killed and the road blocked half a day.

On the afternoon of the 26th a construction train on the Milwaukee, Lake Shore & Western road ran into a car which had been blown out of a siding near Manitowoc, Wis., during a violent storm. The engine and several cars were wrecked and the fireman badly hurt.

On the evening of the 26th 12 cars of an ice train on the Concord Railroad were thrown from the track near Merrimack, N. H., by a broken axle, blocking the track several hours.

On the evening of the 26th a freight train on the Logansport, Crawfordsville & Southwestern road struck a rail which had been laid upon the track near Clymer's, Ind. The engine went into the ditch and eight cars were piled up on it and wrecked. One of the train-men was killed, one fatally hurt and another badly.

Very early on the morning of the 28th an express train on the Houston & Texas Central road ran over a misplaced switch and into the rear of a train which was standing on the Waco Branch track in Bremond, Tex. The engine was damaged and two cars of the branch train were badly broken.

On the morning of the 28th, as an express train on the New Jersey Midland road was between Deckertown and Hamburg, N. J., an axle broke under the tender and the tender, baggage and two passenger cars were thrown from the track, tearing up the rails for some distance and breaking some of the trucks badly. A brakeman was badly bruised and the track blocked for several hours.

On the evening of the 28th, at White Bear Junction, Minn., on the Minneapolis & Duluth road, a mixed train was thrown from the track by the spreading of the rails. The engine and several freight cars were piled up together and badly broken and one man was hurt.

On the morning of the 29th a freight train on the Illinois Central ran into three cars which had been blown out of a siding at Baileyville, Ill. The engine was wrecked and 21 cars were more or less broken, the engineer, fireman and a brakeman hurt and a tramp, who was stealing a ride, killed.

On the evening of the 29th, an east-bound extra freight train on the Chicago, Rock Island & Pacific went upon a siding at Utica, Ill., to allow another train to pass, and the engine went out of the siding to take water, and on returning the brakeman forgot to close the switch. The west-bound freight came up soon after and ran over the open switch and into the head of the extra, damaging both engines, wrecking a tender and several cars which were piled up on the track. While the wrecking train was clearing the track a piece of the wreck slipped and knocked a by-stander into a pond hard by, pinning him down so that he was drowned before it could be moved.

This is a total of 52 accidents, whereby 19 persons were killed and 73 injured. Twelve accidents caused the death of one or more persons, 14 injury but not death, while 26, or 50 per cent. of the whole, caused no injury serious enough for record.

These accidents may be classified as to their nature and causes as follows:

COLLISIONS:	
Rear collisions.....	7
Butting collisions.....	8
Unexplained.....	1
DERAILMENTS:	
Unexplained.....	8
Cattle on track.....	7
Misplaced switch.....	6
Spreading of rails.....	3
Broken axle.....	3
Broken bridge or trestle.....	2
Accidental obstruction.....	2
Malicious obstruction.....	1
Broken rail.....	1
Flying switch.....	1
Boiler explosion.....	34
Falling rock in tunnel.....	1
Total.....	92

Four collisions were caused by mistakes in orders or as to time of other trains; three by misplaced switches; two by cars blown out of sidings, and one by failure of brakes. Of the broken bridges one was a trestle, which is said to have been in bad condition; the other was a pile bridge, the timbers of which had been partly burned through by a slow, smouldering fire. Thirteen accidents were caused directly by defect or failure of road or equipment.

As compared with June, 1875, there is a decrease of nine accidents and of four in the number killed, and an increase of six in the number injured.

There is an unusually large proportion of collisions, and especially of butting collisions. Cattle on track are usually numerous at this season, but three broken axles are rather out of order. The number of misplaced switches is again unpleasantly large; three collisions and six derailments in so small a number of accidents indicate a great want of care in this respect. The number of accidents is very small, being the smallest recorded for two years past, and very much below the average.

For the year ending with June the record is as follows:

	No. of accidents.	Killed.	Injured.
July.....	73	38	50
August.....	114	27	110
September.....	116	50	182
October.....	88	12	74
November.....	87	24	97
December.....	84	11	62
January.....	60	8	29
February.....	91	15	68
March.....	109	30	95
April.....	56	6	47
May.....	34	13	116
June.....	52	19	73
Totals.....	994	249	1,006

The averages per day for the month were 1.75 accidents, 0.63 killed, and 2.43 injured; for the year there were 2.72 accidents, 0.63 killed and 2.74 injured. Those for the year are thus all greater than for the month.